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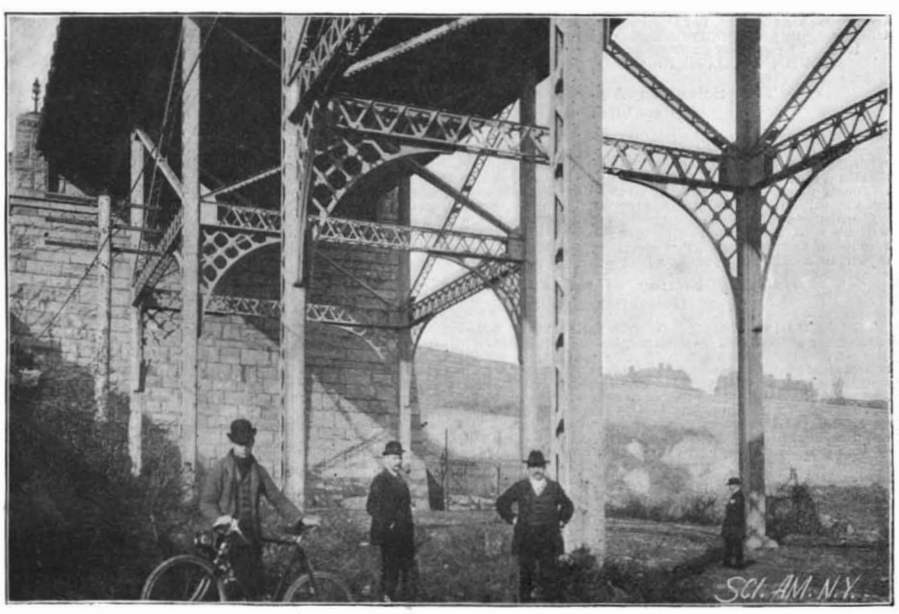
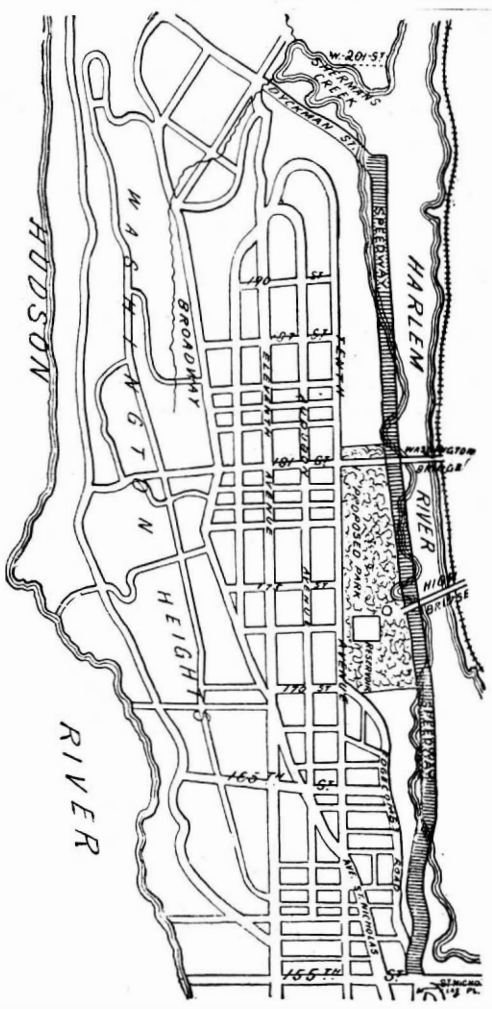
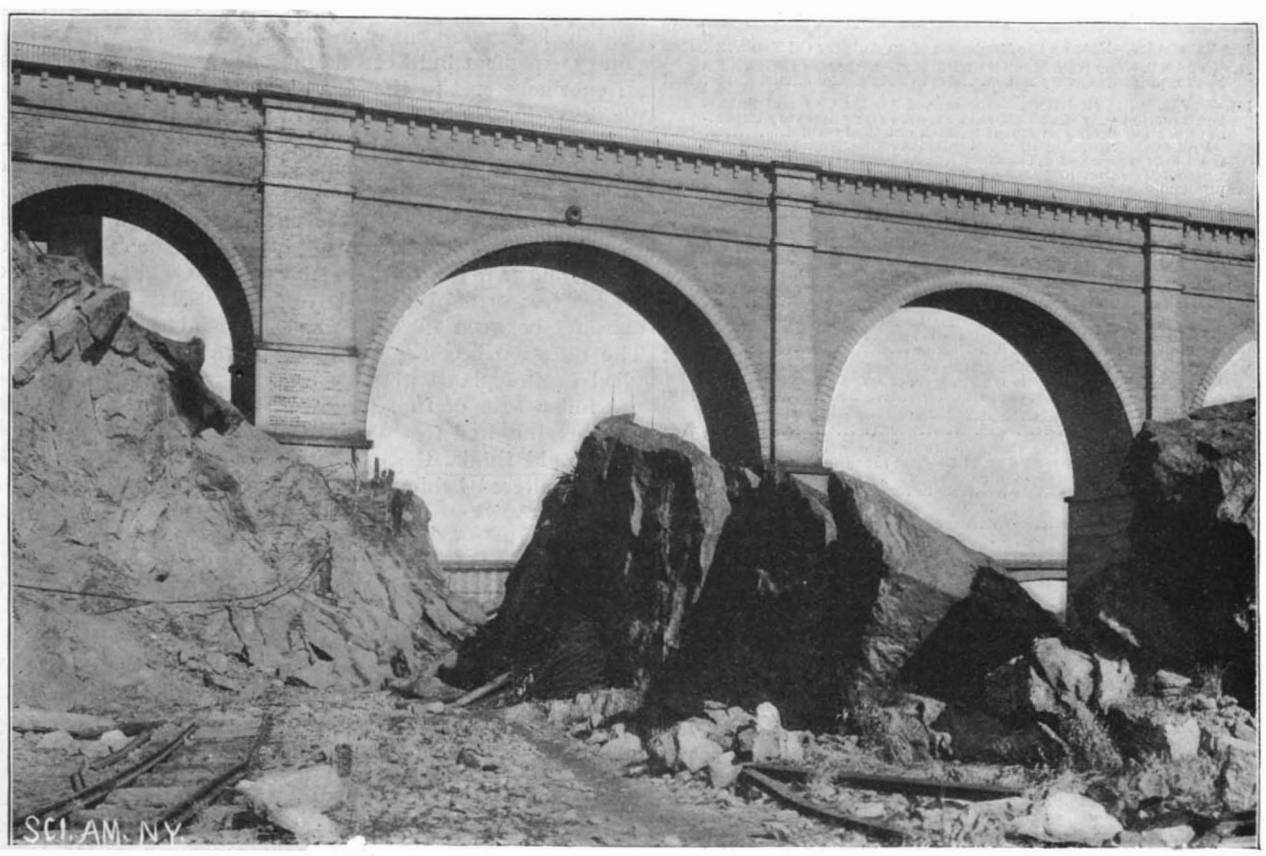
VIEW OF UNFINISHED ROADWAY, SHOWING WASHINGTON'S HEADQUARTERS UPON THE BLUFF.



BENEATH THE 155th STREET VIADUCT—RETAINING WALL OF THE DRIVEWAY SEEN AGAINST THE BLUFF.

DREDGES REMOVING TIMBER CRIB, TO MAKE WAY FOR MASONRY CONSTRUCTION.





ROCK CUT SOUTH OF HIGH BRIDGE—UNFINISHED ROAD AT GRADE.

PRESENT CONDITION OF THE SPEEDWAY, HARLEM RIVER, NEW YORK.—[See page 89.]

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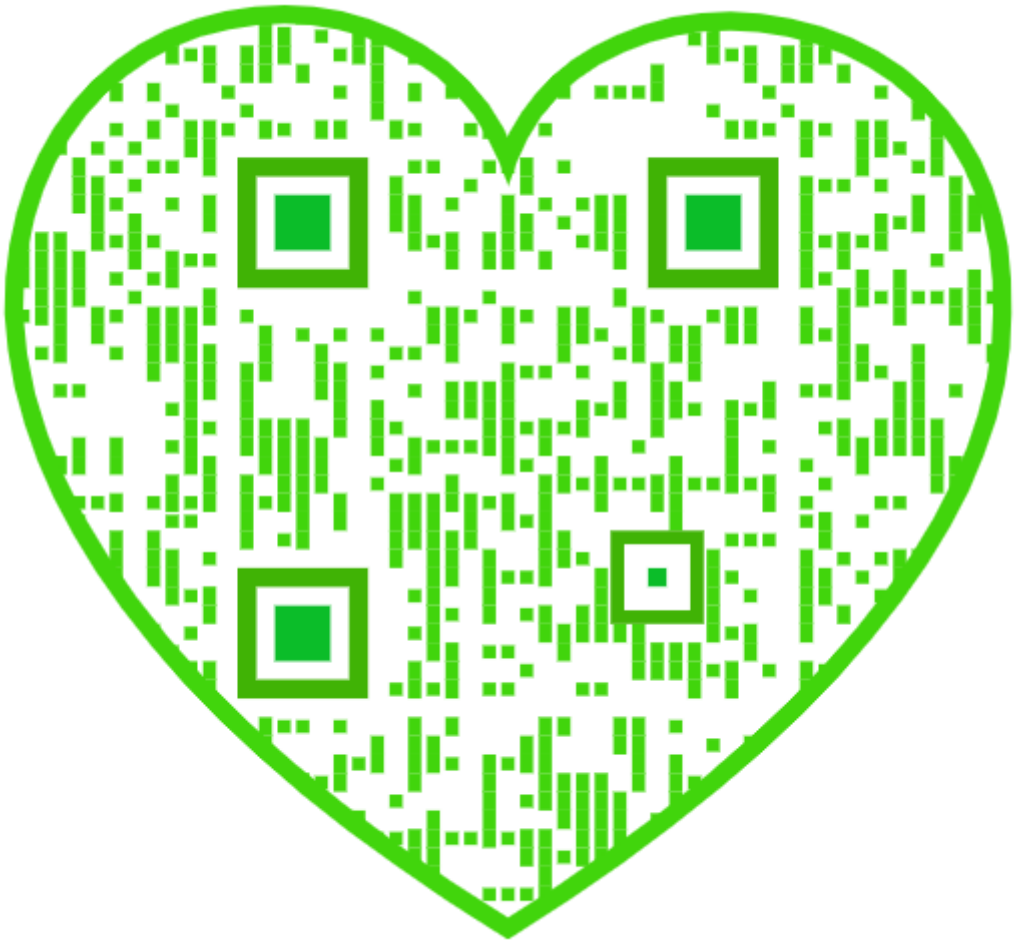

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THE HARLEM RIVER SPEEDWAY.

The Harlem River Speedway, which is now within measurable distance of completion, will show what good engineering, coupled with a discriminating treatment of the natural features of the site, can do in giving at once grace and dignity to a public work of this magnitude; and in this respect it should give genuine satisfaction to the critics who have lately been calling for a closer collaboration between the engineer and the architect.

It is not necessary to recount the history of this undertaking, nor call up the untoward circumstances attending the first abortive attempt to carry it out. Suffice it to say that the present Board found themselves confronted with a difficult problem in the shape of a costly, incomplete, and in many respects poorly planned and worse constructed engineering work, which they were expected to revise and largely reconstruct and carry to a satisfactory completion.

Elsewhere in this issue will be found a detailed description of the undertaking, in the preparation of which we have been offered every facility by the engineers in charge of the work. Our readers will be able to judge for themselves of the value of the modifications in the original plans which have been made by the new Park Board. The improvements are well conceived and, with one exception, well carried out; they will give to this handsome public work both permanence and beauty, essential qualities which it would never have possessed if carried out on the lines of the original plan.

It is greatly to be regretted, however, that where the general design for the improvement of the Speedway was so well conceived, especially in the matter of giving it landscape treatment, the methods adopted in carrying out one of its most important features should have been marked by such blundering and costly extravagance. Reference is made to the construction of some miles of masonry and concrete trenches, whose sole purpose was to hold together the necessary soil for the planting of shade trees and shrubbery.

We are informed that this altogether unique and original device was rendered necessary by the loose character of the cinder filling of which the roadbed is largely composed; that the tide water, percolating through the cribwork and bank, would have been liable to wash away the planting soil, and that on the river side of the Speedway some form of box was necessary to hold this soil in place, and incidentally to keep the salt water from the roots of the trees.

But the parties responsible for this work should have known, as they readily might on inquiry, that where the surface of the ground is from eight to ten feet above mean high water, the majority of hardy trees and shrubs will thrive perfectly well without any precautions having been taken to protect the roots from salt water. A notable instance of this is to be found in the trees and shrubbery of the park which was laid out in the Fens of Boston, whose plantations are carried down to water level. The result in this case speaks for itself and shows that the alleged peril to the shade trees of the Harlem Speedway is purely imaginary.

With regard to the possible washing away of the loam from below, if it were laid in an open trench, it is certain that the crevices of the underlying material would soon have been filled up, and any resulting settlement could have been remedied by laying fresh mould on the surface. But admitting for the mere sake of argument that the looseness of the surrounding fill made it necessary to insert some form of box to hold the loam temporarily in place, why was this temporary expedient built of solid masonry and concrete at an enormous cost to the city. The roughest kind of planking, loosely laid and held in place by light scantling, would have served the purpose equally well, and, indeed, for the future accommodation of the spreading roots of the trees, infinitely better. Moreover, if the masonry was necessary to prevent the washing of the mould by the tidewater, why was it put in at such points as that shown in the views on another page, where there are ten feet of bank and ten feet of first-class cement masonry between the planting space and the river? The question becomes yet more pertinent when applied to the planting space adjoining the bluffs on the inner side of the Speedway and from seventy-five to a hundred feet distant from the river. Surely, one would think, the soil was safe from its enemy when sheltered behind earthworks one hundred feet thick. But it seems not. So remorseless are the waters of the Harlem that even where the sidewalk has been blasted out of the solid side hill, as will be seen from the photograph, the impregnable masonry fort is built upon this rocky bed.

But perhaps it is the rock that is at fault, and there is a danger lest the precious soil should percolate through the gneiss formation of Manhattan Island!

That this amazing device should ever have been adopted is rendered more puzzling when we reflect—and it is evident to the veriest novice in plant culture—that this waterproof box will defeat the very end at which it is supposed to aim; for in winter the impervious concrete floor will hold whatever surface moisture passes down, producing decay at the roots such as would occur in an ordinary flower pot that had no hole in the bottom; and in the hot summer months the heated stone work will merely hasten the drying up of the soil, and the concrete floor will prevent that attraction of moisture from below which is the chief object of surface cultivation.

If the material of the roadbed was altogether unsuitable for the purpose, the simplest and most reasonable course would have been to dig a trench of the same cross section as the present box and place the mould within it. Every benefit and none of the pernicious features of the present suicidal device would have been secured; and as the trees increased in size, their roots would have been free to reach out and take hold of the surrounding material of the roadbed.

That the trees would grow under such circumstances and flourish in spite of rocky surroundings and salt water at their roots (if it ever reached them) is proved by the size and vigor of the trees which are now growing down to the very water's edge on the rocks of the adjoining bluffs.

At a moderate estimate this superfluous masonry has cost the city from $30,000 to $40,000, and it stands there as a menace to the growth and life of the very trees which, forsooth, it was designed to protect. We are informed by prominent landscape architects that a masonry box of the size provided will dwarf the growth of the trees and limit their life to twenty-five or thirty years at the most—from which it is evident that the Harlem Speedway will never be graced with the avenue of stately timber which, presumably, it was in the minds of the Board to provide.

PROPOSED PATENT LEGISLATION.

A bill (H. R. No. 3,014) for amending the patent laws in certain particulars is pending in Congress and is now in the hands of the House Committee on Patents, having passed the second reading. We simply review the nature of the proposed amendments, reserving any comment for a future issue.

The first amendment relates to section 4,886 of the revised statutes, and provides that any person may obtain a patent for an invention not known or used by others in this country before his invention or discovery and not patented or described in this or any foreign country before his invention or discovery thereof, *or more than two years prior to his application*. The second amendment relates to section 4,920, and provides that in an action for infringement it is a good defense if it can be proved that the invention had been patented or described *more than two years prior to his application for a patent*.

The next amendment provides that, if the inventor or his legal representatives or assigns shall have patented an invention in a foreign country, this shall not be a bar to patenting in the United States, *unless the application for said foreign patent was filed more than seven months prior to the filing of the application in this country*. This amendment fixes a term of seven months, similar to the clause touching countries beyond the sea, which is embodied in the International Convention for the Protection of Industrial Property.

The next amendment puts into statute form the present Patent Office rule of practice requiring action upon an invention on the part of the applicant to take place within six months of his last action. If the period of six months is exceeded, the application is to be treated as abandoned. It also provides for putting the case in condition for final action within eighteen months, at the end of which time the Commissioner may require the applicant to show cause why the case has not been more diligently prosecuted, after which hearing he may issue an order requiring applicant to complete his case within six months.

The bill next provides that the assignment, grant, or conveyance of a patent shall be open to acknowledgment before notaries public, United States commissioners, secretaries of legation and consular officers authorized to perform notarial acts. This species of acknowledgment is to constitute a prima facie evidence of the transfer.

The last section limits the periods of accountings to six years before the filing of the bill of complaint. There is to be no recovery of profits or damages for any infringement committed before such period. This it will be seen is in the direction of enforcing diligence in the protection of patent rights. The inventor has long been held to a measure of diligence in prosecution of his claims. The proposed amendment *obliges* him to be vigilant in maintaining the rights awarded him. We feel sure that the amendments will receive careful consideration by the committee.

THE GAS EXHIBITION IN NEW YORK CITY.

On the evening of January 27 there was opened what is said to be the first exhibition exclusively devoted to gas products and appliances to be held in this country. The exhibition is being given in Madison Square Garden, New York, by the Gas Industries Company, which was organized by parties who are interested in many gas companies of this country and the representatives of five State gas associations.

Of course in an exhibition of this kind every source

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of light but gas is rigorously excluded, and to supply the thousands of gas burners, and the various motors and appliances domestic and otherwise, it was necessary to lead in one 8 inch and two 6 inch gas mains for the main floor exhibit and the various side exhibitions shown in the basement.

The lighting of the great building is accomplished by a dozen large crowns of gas light suspended from the roof, and by two continuous lines of light which completely encircle the building, the upper line being placed on the gallery front and the lower line on the balcony front. The latter effect is particularly beautiful; the jets being arranged in clusters of seven in frosted globes, and arranged in the position common in the seven-candle candelabra of the cathedrals. The illumination is further assisted by the myriad lights of the various exhibits, in the center of which and dominating them all is the lofty, spire-like tower erected by the Tiffany Glass and Decorating Company, of New York, from the designs of Mr. Louis C. Tiffany.

The tower, soaring 60 feet in the air, the height of a five story building, is composed of eight sections, representing as many periods in the development of the gas illuminating industry. All of these divisions, rising one out of the other, diminishing in size as they ascend, are ornamented with arches, crockets, finials and canopies, all on purely Gothic lines. Colored glass is worked in here and there throughout the entire construction. The pinnacle of this tabernacle of light, the section representing the decade of 1816, is of yellow, passing into a deeper yellow at the commencement of the section which stands for 1836, then passing into an orange, and from an orange to a light red, and from a deep red into a blue.

On the exterior of the construction there are 2,251 lights, while on the interior there are 688 lights, and all arranged so as to form part of the ornament and to illuminate the various colored glasses, and throw the colors upon jets, fountains and showers of water which are flowing through the tower, the water finally passing into steam, escapes from the upper section, and in its turn catches the reflection of the various colors of the glass.

On entering the Garden the most conspicuous exhibit is that of the Welsbach Light Company. It is in two parts, the booths standing on each side of the main aisle. Like the tower, they are from designs by Mr. Tiffany. The walls consist of an open framework which contains groups of mammoth gilded torches, whose flame consists of a bunch of thirty-one or fifty-two Welsbach lights. Adjoining the right hand booth is the exhibit of the Welsbach Street Lighting Company, in which a large number of street lamps of various and generally artistic design are shown. The Welsbach light is, as was to be expected, abundantly in evidence, and its ability to give at once a soft and powerful illumination is seen to good advantage in all parts of the exhibition.

Undoubtedly the most complete and creditable exhibit is that shown by the United Gas Improvement Company, of Philadelphia, which contains a complete model plant for the manufacture of water gas. The company also shows an historical exhibit, in which is traced the evolution of the water gas process, and close at hand is a rack showing the fractional distillation of gas-making oils. In addition to the model above mentioned, the exhibit contains a full-size water gas producing plant consisting of a generator, carbureter, superheater, oil heater, scrubber and condenser, oil pumps, blower, and every detail of this interesting process. In a smaller exhibit of the same firm will be found a complete analytical laboratory for the analysis of gases, a bar photometer for determination of candle power, and a meter prover.

The E. P. Gleason Company, who claim to have made the first brass gas burner manufactured in America, show a handsome assortment of gas fixtures, from the simplest burners to full sized street and hall lamps resplendent in polished metal and colored glass. Near at hand is the stand of the Continental Iron Works, where three gas gate valves, ten, fifteen and twenty five inches in diameter, are shown, which are fitted with a double screw that enables the valve to be opened and shut with greater speed. An excellent design of self-closing mouthpiece for gas retorts is shown side by side with one of the old type. The old mouthpiece consisted of a separate plate, which was held in place by a screw operating through a cross bar held in hooks attached to the mouth of the retort. The joint was made with lime, and considerable time was occupied in the operation. The new mouthpiece is swung open on a side hinge, and the joint is formed by making a coned face to the door and its seating.

Gas engines are shown by the Pennsylvania Iron Works Company, known as the makers of the "Globe" engine; by Fairbanks, Morse & Company and others. The Safety Car Heating and Lighting Company show Pintsch compressors, buoy lights, etc., and other exhibits worthy of special notice are those of William M. Crane & Company, the Parker Russel Mining and Manufacturing Company, and Hartlett, Hayward & Company.

Taken altogether, the exhibition is well calculated to impress the public with the vast extent of the gas industry and the high degree of perfection which has been reached, both in its manufacture and application to industrial and domestic purposes.

It is shown in operation in every imaginable kind of stove, whether for cooking or heating, and some very tasteful designs of radiators are exhibited. The gas motors range in size from diminutive engines, suitable for light household work or the amateur workshop, up to the powerful machine for shop use.

The basement has been given up for supplementary exhibits, such as from their nature could not be accommodated on the main floor. Conspicuous among these is a full sized representation of a coal mine, complete with tracks, coal trucks, and the various appliances used in up-to-date mining. The concert hall is used as a lecture room, in which the householder will be startled with facts and figures going to show the wastefulness of cooking by coal and the net saving per year to be realized by using the more cleanly and economical gas stove.

THE STEAM TRIALS OF THE LARGEST CRUISER IN THE WORLD.

The great English cruiser Terrible, a sister ship to the Powerful, the details of whose trial trip were given in our issue of January 2, has also completed her trials and has shown very excellent results, maintaining 22·4 knots on a four hours' trial. She was built from the same plans as her predecessor, and is in every way identical except that the propellers of the Powerful are made of Admiralty gun metal, and those of the Terrible of manganese bronze; by using which it became possible to reduce the thickness of the blades considerably and give their surfaces a fine polish, thereby considerably reducing the loss due to propeller resistance proper.

These two magnificent ships are of such exceptional size and power that they have attracted widespread attention, and the interest has been increased by the fact that they were to be equipped entirely with water tube boilers, whose aggregate horse power was to be 25,000. They are the first war ships to exceed a length of 500 feet, and they are built in agreement with the tendency of naval designers to increase the all around dimensions of naval vessels, and especially that of length. The Russian cruiser Rurik was the first to reach the limit of 400 feet, and she was followed by the United States cruisers Columbia and Minneapolis with a length of 412 feet.

The Powerful and the Terrible are 538 feet long, 71 feet beam and 43 feet 4 inches in depth to the upper deck. Their displacement is 14,200 tons and designed speed 22 knots. On a four hours' trial against a head sea the Powerful averaged 21·8 knots an hour, and on her recent trials the Terrible made 22·4 knots. They have a complete protective deck from 3 to 6 inches thick, which is reinforced with many feet of coal protection. The armament consists of two 9·2 inch guns mounted in barbettes, twelve 6 inch quick-firing guns, twelve 3 pounders and nine machine guns. There are four torpedo tubes.

At the launch of the Terrible it was stated by her builders that she was designed for the purpose of being able to maintain a continuous rate of high speed at sea in any weather. She was to be capable of catching the largest and swiftest ocean steamers, and it was considered that the only way to insure this result was to give her the great length, weight and power of an Atlantic liner. Experience has shown that in heavy weather the longer and larger ship will maintain the best rate of speed, other things being equal. Her greater momentum will cause her to be less affected by the concussion of the waves, and her greater freeboard will carry her over the seas with a dry deck.

In the first of the trials of the Terrible, 14 of the Belleville boilers out of the 48 were used. The horse power was 5,000, coal consumption 2·27 pounds per indicated horse power hour, and the corresponding speed 13·3 knots. The trial at 18,000 horse power lasted for 30 consecutive hours. The coal consumption was 1·7 pound per horse power hour and the mean speed was 21 knots per hour, which, considering that she was only working up to about 70 per cent of her maximum power, was an exceptionally fine performance. In the four hours' full power trial the steam pressure in the boilers was 229·6 pounds per square inch, the mean vacuum in the condensers 26 inches, the mean revolutions 112 per minute, and the indicated horse power 25,572, the mean speed being 22·4 knots an hour.

The enormous coal supply—3,000 tons—carried by these ships would enable them to travel 4,200 knots at a speed of 21 knots an hour.

The Chicago Bicycle Show.

The bicycle exhibition which was held at the Coliseum, at Chicago, last week, shows that in the majority of machines no radical changes have been made, although many new ideas have been incorporated in the structure of the wheel. It must be said, however, that these changes have very largely been introduced by the smaller and less known manufacturers. In general, the wheels are slightly heavier than last year, very few being shown which weigh less than twenty pounds. The frames are practically the same as those used in last year's model. Many of them have ingenious flush joints. The treads are narrower and hubs are larger as a rule. The improvement in the bearings is most noticeable, a large percentage of the wheels being dust proof or nearly so. They are fitted in many cases with ball retaining devices, the balls themselves are larger and the cones are constructed so that the friction is reduced. The crank hanger has a greater drop than last year, and the tendency seems to be toward the simplification of both crank and sprocket. There seems to be a desire on the part of many makers to return to the old form of crank construction, the round crank apparently giving way to the square crank. The easily detachable sprockets and movable bearings are much in evidence. Many of the exhibition wheels are provided with gear cases. Adjustable handle bars still seem to retain their popularity and a number of different grips are on exhibition. The wooden handle bar is also popular.

The desirability of large tires seems to have been demonstrated by the season just passed, and they are provided for in many of the new wheels by proportionately large fork side clearings. A number of puncture proof and non-slipping tires are exhibited.

Tandems and other combination machines are shown in considerable variety, and one of the novelties is the hydrocycle designed for use on the water. Among the sundries, of which there are a large number, lamps are specially noticeable. An acetylene gas lamp is shown, as well as a number of electrical lamps. All kinds of oil and vapor lamps are exhibited, but there are few radical improvements.

The Discharge of the St. Lawrence.

Professor C. H. McLeod, of the McGill University, Montreal, has recently conducted an inquiry as to the discharge of the St. Lawrence River some forty miles below Montreal. The level of the St. Lawrence has been falling for some years past, and last year reached a point below all existing records. It was therefore of interest to ascertain what was the corresponding change in the discharge as ascertained some ten years ago by Mr. Sproule for the Montreal Flood Commission. The section of river selected for the experiments was 3,000 feet long, the width being about the same. A series of tube floats were prepared, ranging from 2 feet to 42 feet 6 inches in length, and the time taken for each to cover the full course of 3,000 feet noted. The path of each float was traced by taking numerous observations of its position, and in all cases proved to be very regular. The cross section of the stream at the time of Mr. Sproule's experiments worked out to 115,298 square feet, and the discharge to 311,101 cubic feet per second. The lowering of the water level in Professor McLeod's experiments had reduced this to 105,432 square feet, and the discharge to 216,621 cubic feet per second. These latter experiments were, however, made in November, when the water stood 10 inches higher than at the end of October, so that apparently the minimum discharge would be about 196,000 cubic feet per second. From the above, it would appear that the mean velocity of the stream is about 2·06 feet per second, and from this it follows that the energy stored in the water passing per second is no less than 895,000 foot pounds per second at the time of Professor McLeod's observations. This would be equivalent to over 1,600 horse power, but, of course, there is no possibility of ever utilizing industrially the flow of such a stream.—Engineering.

An Improved Bunsen Gas Burner.

Dr. K. Bierbach, of Berlin, has made a material modification of the ordinary Bunsen burner, says the Progressive Age. The Bunsen burners now in use suffer from too great rigidity of form, which makes it impossible to use the burner for certain purposes. A lateral heating of apparatus can be accomplished by the ordinary Bunsen burner with difficulty only, while in some cases it is entirely out of the question. Yet it is frequently a necessity, for instance, in the distilling of liquids possessing a very high boiling point, or of those which are violently agitated by boiling; or it is desirable for other reasons to place the burner not under but beside the apparatus. The improved burner is so constructed that its flame can be moved in every direction like the stream of a fire engine. The burner consists of a mixing tube for gas and air bent in a right angle so as to form a long shank and a shorter one. The long shank is so arranged in a ring provided with a screw that it can be turned and moved in the ring. The ring can be turned around the axle of a vertical joint which rests upon a flat plate-shaped foot. By this triple action the knee tube can be put into any position desired and the mixture of gas and air can be conducted through it in both directions by means of an adjustable rubber tube. When the gas is conducted through the lower shank the burner can be placed under the lowest apparatus, when it flows into the shorter shank the position of an ordinary Bunsen burner is obtained; by inclining it lateral heating can be accomplished.

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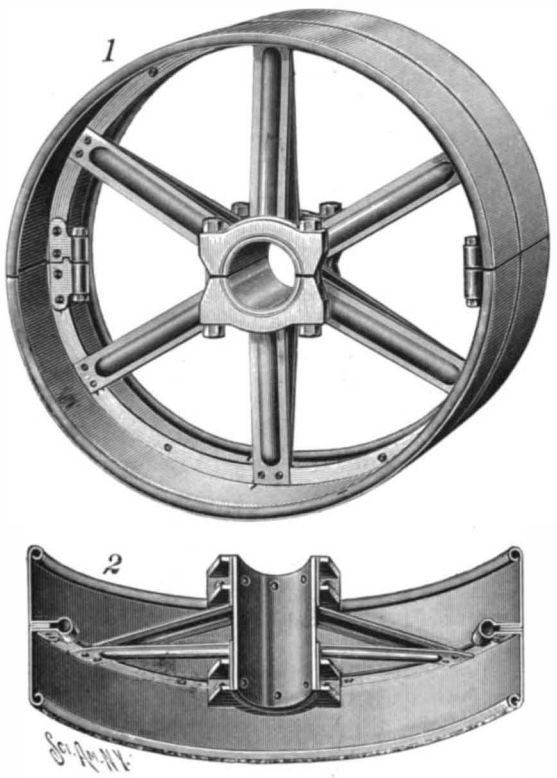
ALL WROUGHT STEEL PULLEYS.

The illustration represents the construction of pulleys entirely of what is generally known as mild steel, no castings or forgings of any kind being used. The various parts of the pulley are cut from the material in sheet form, and then pressed into the required shapes and assembled into the finished pulley, all being accomplished by machinery of special design and which, though of great original cost and variety, is most efficient and economical in its operation, producing without turning, boring, grinding, or other machine shop practice and without hand labor, a true running pulley of perfect balance. The high tensile resistance and ductility of the steel used enables the construction of a pulley about one-third the weight of one made of cast iron, and, in fact, the steel pulley is lighter in average weight than the wood pulley commonly used. The pulley shown is what is ordinarily known as a split pulley, clamping firmly on the shaft with sufficient



A WROUGHT STEEL BELT PULLEY.

compression to transmit as much power as is possible to carry with the heaviest belt practicable, and its construction permits of the use of keys when required in special cases. Fig. 1 shows the pulley in side view and Fig. 2 is an interior view of one-half of the pulley, the other half being removed.

This improvement has been patented in the United States and foreign countries by Thomas Corscadon, of New Britain, Conn., and is being introduced by the American Pulley Company, George V. Cresson president, Eighteenth and Hamilton Streets, Philadelphia, who have fitted their factory with the machinery and tools necessary for its manufacture.

The pulley consists of the rim portions rolled at outer edges, which are made round and smooth, avoiding cutting the belt or hands of the mechanic when throwing belts on or off. The middle portion of the rim is formed into a deep flange extending entirely around inner periphery of rim, and, with the rolled edges, making with a minimum thickness of metal an exceedingly strong and true rim. The double spoke arms are greatly stiffened with deep corrugations through their entire length, and in combination with the double arms make the spider of the pulley of great strength and rigidity. The spoke arms are of the same piece of metal with the hub portion thereof, and the hub clamps encircle the hub portion of the arms, binding them firmly to the hub shells which form the bearing for the pulley on the shaft, all being riveted strongly together and making a pulley of excessive strength for its weight and impossible to break accidentally or by running at high speed, certainly many times greater than is practicable or safe with the cast-iron pulley. The steel of which the pulley is made has a smooth surface and is rolled accurately to gage, the rim face being highly polished. The interior surfaces of the pulleys are well painted and rim face lacquered, preventing rust by accidental wetting in shipment or dampness in warehouse. By means of steel bushings the pulleys are made interchangeable to fit different diameters of shafts, and their light weight on warehouse floors and minimum of fire risk make them especially adapted to be carried in stock by dealers.

Hunting with a Mirror.

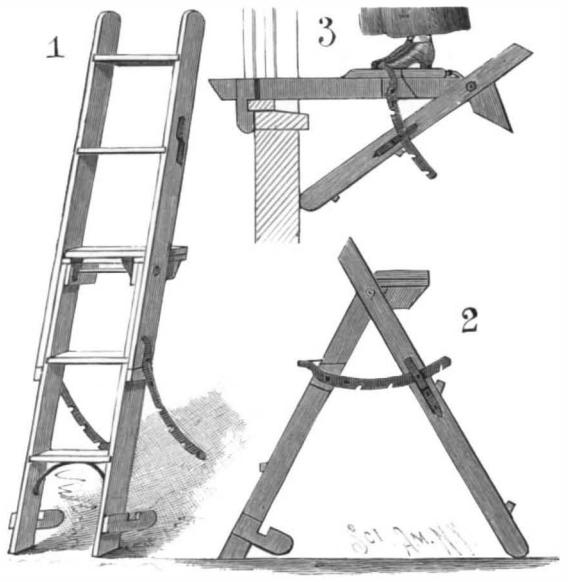
A taxidermist at Northwood, N. Y., says the New York Sun, has been making experiments as to the effect of light reflected in a bird's eyes. A glass seven or eight inches in diameter has been found most serviceable. The antics of blue jays are remarkable when the light strikes them as they sit in the shadow of an evergreen tree. They jump to another branch and try to look into the light, but they have to turn away, as the light dazzles them. Then they fly around the reflector, but after practice one is able to keep the light always on them, and the birds not infrequently come within reach of a man's hand. A ruffed grouse gives a startled look when the light strikes it. Then up it jumps, and away it goes. Hawks, too, are usually startled or annoyed so that they fly off. Woodpeckers don't seem to mind it at all. Rabbits blink and stare at a glass for a while, then go around a stump, and sit up again, as if waiting for the light to play tag with them.

SETTING NEW TIRES AND RESETTING LOOSE TIRES COLD WITHOUT TAKING OUT THE TIRE BOLTS.

The inventor of the machine represented in the accompanying illustration first conceived the idea of setting tires "cold" in 1867, and his first patent therefor was issued in 1870. The machine had a pliable steel band drawn around the wheel by a screw, much like tightening a girth around a horse, and set light tires very well, many of the machines being still in use. They were manufactured by the Mowry Axle and Machine Co., Norwich, Conn. In 1888 a hub bander was put on the market, having twelve radially moving dies actuated by toggle joint levers and a steam cylinder, and a tire setter was then built on the same principle, which did well for light tires. The inventor, Mr. J. B. West, of Rochester, N. Y., then proceeded to develop the machine shown in the engraving, in which are eighteen hydraulic rams in a circle surrounded by a heavy weldless steel ring, with suitable bed casting, oil being used instead of water in the rams, and a three-throw pump giving a maximum pressure of a thousand tons. The rams act upon a corresponding series of segmental blocks of cast iron for smaller wheels, forcing them in radially as the pressure is applied, the wooden wheel being placed within the rams and the tire passed loosely over it. The pistons are set to work by simply opening a valve, and an automatic trip gage operated by the dishing of the wheel stops the machine when each wheel has just the right dish. A screw can be used to hold the hub down on old wheels that are inclined to dish too much. Hundreds of these machines have been sold, and nearly a dozen patents have been taken out by its inventor since 1890 on various improvements connected therewith, including one hand machine actuated by screws for light and one for heavier tires operated by a hand hydraulic pump. In 1894 permission was reluctantly given to set up a machine for trial in a wagon shop on Camberwell Road, London, England; but after one day's use the proprietors bought the machine, and the English patent was subsequently sold and a plant established to build the machines in London, since which the same syndicate has bought the patents for twenty-four countries. The machines have since been largely sold in most European countries and in South America. It is proved that more durable, truer and rounder wheels, with a stiffer, tougher and better tire, are made by this machine than is possible by any other method. The effects of the compression on Bessemer steel are indicated by two pieces from the same bar that were tested by Riehle Brothers, of Philadelphia, one that had been upset four per cent of its length by the tire setter proving to be about thirty-eight per cent stiffer and fourteen per cent superior in tensile strength to the piece that was not upset. The inventor has recently constructed a much heavier machine that has set steel tires on car wheels which has proved satisfactory on heavy wheels for steam roads. The machine weighs nearly twenty tons and is capable of exerting a maximum pressure of about ten thousand tons.

AN EXTENSION LADDER AND WINDOW JACK.

A device of simple construction which may be used interchangeably as an ordinary step ladder or extension ladder, or as a conveniently arranged bracket platform support, to facilitate cleaning the outside of windows, is shown in the accompanying illustration. The improvement has been patented by John M. Pugh, of Reno, Nevada, Fig. 1 showing it as an extension ladder, Fig. 2 as a step ladder, and Fig. 3 as a window bracket. At the upper end of the bottom

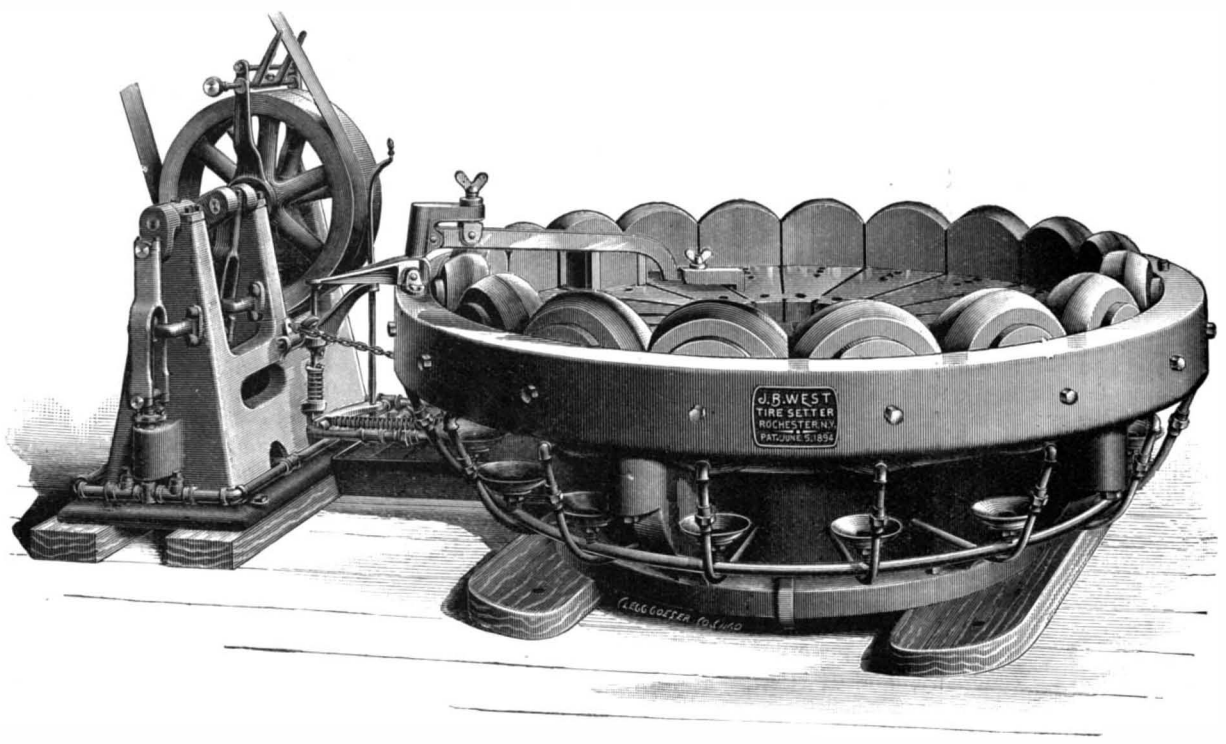


PUGH'S EXTENSION LADDER AND WINDOW JACK.

section is pivoted a brace section, which may be moved up in alignment with the first section to form an extension ladder, the upper section then resting on blocks on the outer faces of the side pieces of the lower section. On these blocks are also pivoted notched curved braces, the notches engaging pins in a guideway on the brace section, whereby the sections may be adjusted as a step ladder or to form a window bracket. To adapt the ladder to the latter use, there are notched shoes, adapted to engage a window sill, near the lower ends of the lower side pieces, and the upper step is made in two hinged pieces, one folding on the other and pivotally connected by links with braces, whereby the two pieces of the step may be adjusted side by side on the side pieces of the bottom section to form a platform for a person to stand on, the curved braces being adjusted to hold the brace section in proper supporting position.

The Danger of Early Rising.

Yet another venerable superstition has met its doom at the hands of the irrepressible "scientist," says the London World. Until now people have been content to accept, if not to act upon, the theory that early rising—in conjunction, of course, with a correspondingly early habit of going to bed—is conducive not only to wealth and wisdom, but also to health. Indeed, a familiar rhymed adage protests as much in so many words. But, like many another primitive belief, it has been ruthlessly shattered by the scientific iconoclasts, one of whom now claims to have discovered that people who get up early go mad much more readily than others. In support of his theory he points to the undoubted prevalence of insanity among those engaged in agricultural pursuits. Though it is sad to see a time-honored doctrine thus exploded, one is disposed to favor the new opinion at the expense of the old. In any case, there can be no harm in being on the safe side, and, after all, it is so easy not to get up early.



WEST'S HYDRAULIC TIRE COMPRESSOR.

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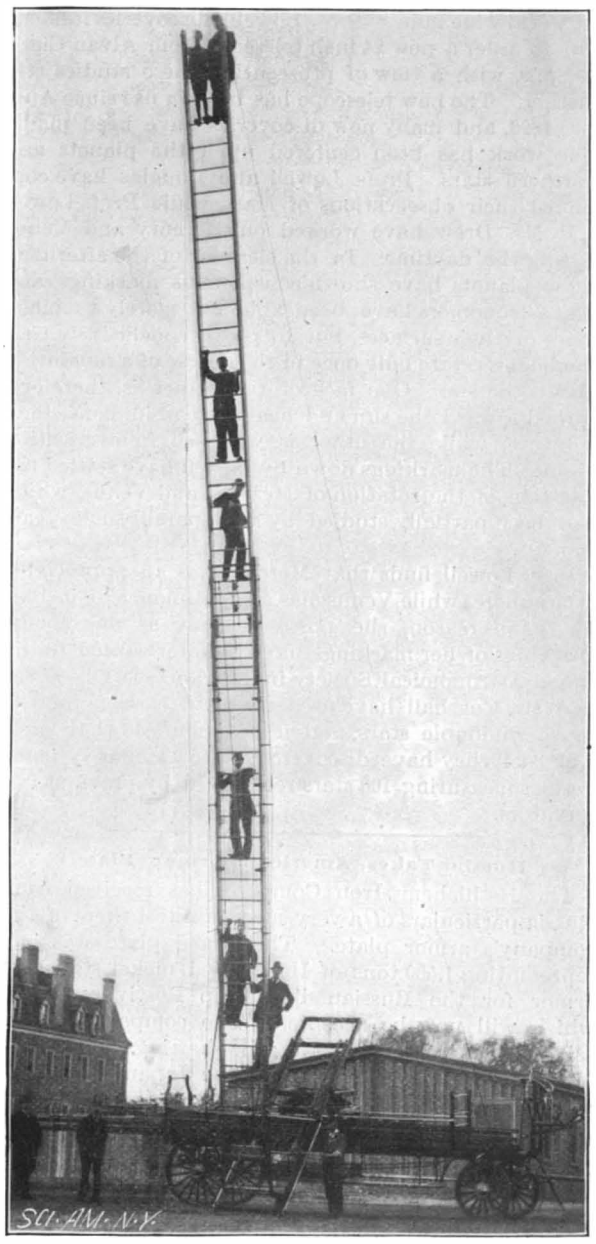
Rapid Firing at Home and Abroad.

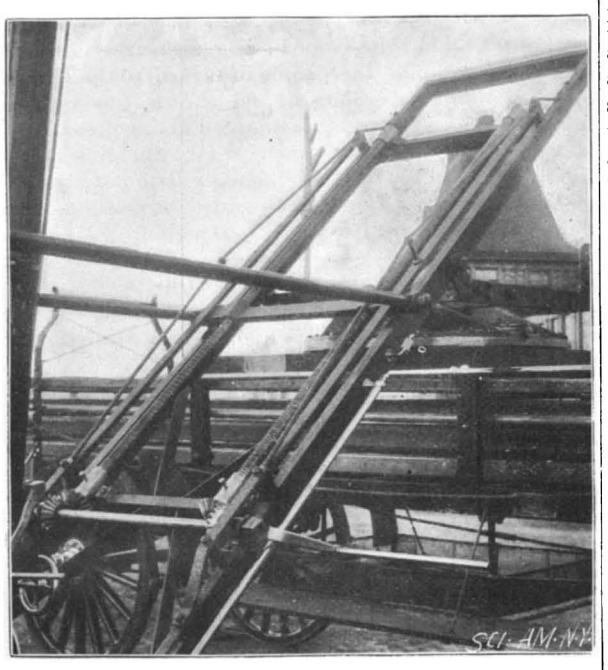
An English officer on Indian service, who recently spent his holiday in the Alps with the special object of reporting on the comparative efficiency of French and Italian batteries with regard to English, had no hesitation in deciding, says the Admiralty and Horse Guards Gazette, that in rapidity of fire and general smartness our men and mountain guns were ahead of both countries. There were some points of special excellence about both corps, and with regard to the Italians one fact may be noted. The men were trained and accustomed to carry the component parts of the gun themselves; but in accuracy of fire as well as rapidity, and with regard to the general smartness of the men themselves, he would have had no doubt in putting our own mountain batteries into competition with either French or Italian. But the high standard of merit attained with regard to accuracy relates exclusively to stationary objects, and it is felt that the results attained at the ranges might be easily falsified on the field of battle against moving objects, and especially against the rapid movements of cavalry. At the present moment there is no place in India where firing at moving objects can be practiced, and even in England it is only quite recently that the simple moving target on a pair of rails has been established at Okehampton. Even there the target is never moved at anything approaching the rate at which cavalry would charge, and, moreover, the object fired at moves across the horizon instead of toward the guns themselves, as would be the case with cavalry in real war.

THE HORTON FIRE LADDER APPARATUS.

The accompanying illustrations represent a fire ladder apparatus designed to combine the advantages of the ordinary hand ladder truck, a main extension ladder useful at high buildings, and a substantial water tower, the entire apparatus being of much less weight than has been heretofore deemed feasible. It is claimed that the truck and an 85 foot ladder built on this plan will not weigh over 7,000 pounds, as against a weight of over 12,000 pounds for the same extension in the ladders hitherto most approved. In the improved ladder, also, the steering wheel may be dispensed with, as the distance between the hind and fore wheels is only about 14 feet. The improvement is the invention of William J. Horton, of Halifax, N. S., Canada, and is being introduced by the Horton Fire Ladder Company (Limited), of that city, patents having been obtained thereon in the United States, Canada, Great Britain, France and Germany. The ladder platform is connected to the main frame of the truck by a rocking yoke swiveled to swing horizontally, enabling the platform with its raised or partly raised ladder to be turned one-quarter around and then tilted to the ground on one side, the ground end of the tilted platform being then adjusted by side levers, as is also the lateral adjustment of the upper portion of the main ladder. By this means a solid foundation is obtained and the weight is taken off the truck, which then forms an anchor. The mechanism for raising and bracing the ladder comprises principally a pair of screws having nuts which are coupled by connecting rods to opposite sides of the pivoted ladder, as shown in one of the views, the ladder-raising screws being fitted in front thrust bearings held to the platform



THE HORTON FIRE LADDER EXTENDED VERTICALLY.



THE HORTON FIRE LADDER ELEVATING MECHANISM.

sides and in rear metal plate bearings which form the back end of the ladder platform, large gear wheels engaging pinions fixed on the screws, and the gear wheels being rotated by a crank turned by the firemen on the rear step of the platform. The drum, wire rope and pulley mechanism, for extending the upper or fly ladder, is also operated from the platform, the upper ladder being extended as desired and safely held, or again lowered after use, by operating the drum. Sockets in the side bars of the ladder sections carry bracket forks in which the hose may be placed to assist or relieve firemen on the ladder, enabling them to direct the stream to the best advantage, and the hose may be raised as the ladder is raised to any required height. It is claimed that this ladder can be raised by four men in less time than other ladders can be raised by eight or ten men.

Method of Coating Paper with Emulsions.

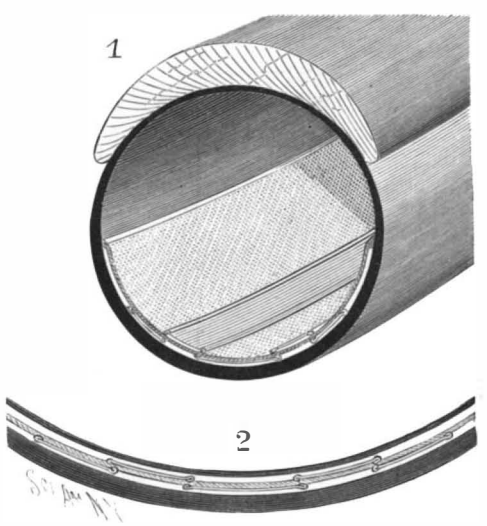
A correspondent in Photography describes the following plan of coating paper with emulsions: The coating of paper with emulsion in a liquid state is attended with such difficulties as unequal expansion of the paper, and the too rapid solidification of the emulsion into lumps or waves. The following method (due to White) coats the paper with the cold and solidified emulsion, and then produces an even coating by application of a very gentle heat, just sufficient to melt the emulsion. The apparatus required is very simple: it consists of a zinc or tin reservoir of hot water, in section of quadrant shape. Two openings at the top allow of hot water being poured in. The back, sides, and bottom of the reservoir should be covered with felt. It is not necessary to keep a light burning underneath, for when once filled with hot water the apparatus suffices to prepare 300 to 400 feet of paper. To the upper part of the back of this apparatus is fixed a perfectly horizontal board, about 2 feet wide and 8 feet to 10 feet long, and to the lower end of the reservoir a similar board is attached. The lower board is used for applying the cold emulsion to the paper, and the upper board for smoothing and solidifying the same. The paper to be coated is generally 22 inches broad, and in lengths of 8 feet to 10 feet (these are convenient dimensions). Proceed now as follows: Lay one piece of paper on the lower board, take the emulsion, either in lumps or pressed through canvas, and by means of a stiff bristle brush (one about 8 inches broad, similar to the tool used by bookbinders) work the mess as a paper hanger does his paste. By skillful working of the brush a coating quite flat and free from lumps can be given. Now take one end and steadily and regularly (though fairly quickly) draw it over the central reservoir containing the hot water. The slightest contact with the warmed surface is sufficient to make the emulsion flow, and it naturally solidifies, the more quickly the less heat is employed. When it has reached the other board it is allowed to remain lying until the next piece is coated with emulsion. It can then be hung in a drying chamber to dry. It is important to note that just sufficient heat should be applied as will melt the emulsion. Delay or too long contact of the paper with the hot zinc removes the solution partly from the paper, and causes undulating marks, such as are seen in badly prepared albumen papers.

Recent Discoveries in Palestine.

The Quarterly Statement of the Palestine Exploration Fund, in noticing some recent discoveries by the society's officers, says: "Dr. Bliss' excavations in the Tyropœon Valley have brought to light a very remarkable stone stairway, forming part of a road leading down from the city past the Pool of Siloam. This stairway is 24 feet broad, and on its eastern side is a parapet, apparently constructed to prevent passengers falling over the scarp which exists there. The steps are thirty-four in number, so far as discovered. They are about 7 inches in height, and are arranged in a system of wide and narrow treads alternately, the wide treads measuring between 4 feet and 5 feet in breadth, and the narrow ones about 1¼ feet. The stones composing these stairs are well jointed and finely polished by footwear. It is impossible not to be reminded by this important discovery of the statement in Nehemiah iii, 15, that Shallun repaired the gate of the fountain, the wall of the Pool of Siloam, by the King's Garden, 'and unto the stairs that go down from the city of David.' It is not suggested that these newly discovered stairs are identical with those mentioned by Nehemiah, but possibly they may be on the same site. Also another paved roadway leading down from the city has been discovered near the top of the hill, a little east of David's Tomb, and apparently continuous with the long street which runs through the city from the Damascus Gate and traverses the present Jewish quarter. In its width, in its curb on either side, in the size and appearance of its slabs, and in its inclination, this street resembles the one found in the Tyropœon Valley. Students of Jerusalem topography have long been of opinion that such a roadway existed in this situation. The main thoroughfares of a city are apt to remain in the same spot from age to age, and it has always been thought probable that the great central street of the Holy City was continued further south than the present wall. Of quite special interest is the rock tomb near the Tombs of the Kings described by Mr. Dickie. It is the only rock tomb with a vertical shaft which has yet been discovered in South Palestine."

A NOVEL PNEUMATIC TIRE.

The illustration represents a tire having a novel form of protective shield, designed for application to a single or double tire, without in any manner detracting from its resiliency. Fig. 1 shows a section of a tire on which the improvement is applied, and Fig. 2 a portion of an outer and an inner tire and an enlarged section through the shield. A patent has been issued for this invention to Joseph F. Dolles, of Chester, Ill. The shield is placed next the inner face of the outer tire at its tread portion, and between this tire and the tread section of the inner tire when used with an inner tire, and consists practically of a diaphragm of canvas to which are attached a number of endless bands of very light spring steel. The bands are placed along the inner as well as the outer face of the body of the diaphragm, there being preferably a central wide band and two narrower bands near the side edges, the sides of the inner bands extending over upon the body portion of the



DOLLES' BICYCLE TIRE.

outer bands. Each of the bands has a rib along its sides, the ribs being bent over on the slightly convexed outer faces of the bands, and the bands are so overlapped as to make it difficult for any sharp object piercing the outer tire to pass between the inner and outer bands where they connect. The diaphragm or shield is made air tight when used with a single tube tire, and may be secured to the sides of the outer tube in any approved manner, or the canvas may be woven in to form an integral portion of the outer tube. The improvement is designed to add but little to the weight of the tire and not to stiffen it or in any way mar its appearance.

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The Ravages of Consumption in New York.

The Health Board of New York City considered, on January 12, a report on tuberculosis made by Dr. Hermann M. Biggs, its pathological expert; Dr. T. Mitchell Prudden, consulting pathologist, and Commissioner George B. Fowler. The report recommends the establishment of a hospital where cases of consumption can be treated separately.

After saying that in the last twelve years there has been a reduction in this city in the mortality from tubercular diseases of over 30 per cent, the report shows how deadly consumption still is:

"During the past year nearly 9,000 cases of tuberculosis were reported to this department and nearly 6,000 deaths resulted from this disease. It is conservatively estimated that at least 20,000 cases of well developed and recognized pulmonary tuberculosis now exist in this city, and an additional large number of obscure and incipient forms of the disease. A very large proportion of the former cases constitute more or less dangerous centers for infection, the degree of danger depending in each instance upon the intelligence and care which are exercised in the destruction of the expectoration. It may be safely assumed that from the failure to safely dispose of the sputum of consumptives, from thirty to fifty inhabitants of this city daily become infected by tuberculosis, and of these about one-half later die from the disease. All this suffering and death, in view of modern scientific knowledge, we know to be largely preventable by the efficient enforcement of simple, well understood, and easily applied methods of cleanliness, disinfection and isolation.

"The knowledge now at command regarding the methods of extension of pulmonary tuberculosis entirely justifies the belief that its ravages can as certainly be limited by proper sanitary control and appropriate treatment as can other infectious diseases, more acute, more dramatic, and more readily communicated, but at the same time far less prevalent, less fatal, and incomparably less important to the welfare of the community.

"From the beginning of this work the officials of this department have encountered, in the utter lack of properfacilities for the care of consumptives, an obstacle to practical success so great and so disheartening that we feel impelled to urge our conviction that the grave responsibilities which rest upon the Health Department in this matter cannot longer be adequately sustained without the immediate establishment, under its direct control, of a hospital for the care and treatment of this disease. No week passes in which the officials of this department do not encounter many instances in which the members of many households, numerous inmates of crowded tenement houses, employes in dusty and ill-ventilated workshops, and many others are exposed to imminent peril from victims of this disease, to whom either the doors of our overcrowded public institutions are closed or who reject all proffered assistance and instruction and, from ignorance, indifference, or inability through weakness due to the disease, scatter infectious material broadcast, and thus diminish their own chances for recovery and imperil the health and safety of others. In such cases the sanitary suggestions of the Health Department inspectors are now futile, and effective action impossible. We are convinced that no other factor is so potent to-day in perpetuating that ominous death list from pulmonary tuberculosis as the lack of proper facilities for the care of the poor of this city stricken with this malady.

"The best medical opinion forbids that persons suffering from pulmonary tuberculosis be treated in association with other classes of cases in the general medical wards of general hospitals. This opinion is based on the daily observation that comsumptives, when occupying hospital wards in common with other classes of cases, not only constitute a serious source of danger to other patients, but that they are themselves placed under peculiarly unfavorable conditions. This is an opinion which the former action of this board has done much to establish and extend. It has very properly resulted in the exclusion to a large extent of persons suffering from this disease from many of the general hospitals to which they were formerly admitted. . . .

"As the Health Department has already declared its conviction that pulmonary tuberculosis is a communicable disease, and has taken steps looking toward its prevention, and as the information at hand shows that it is far more fatal than any other communicable disease with which the board has to deal, and destroys each year more lives than all the other communicable diseases together, it would seem self-evident that some efficient and far-reaching measures should be at once adopted to protect the inhabitants of this city from its further ravages. . . .

"We would, therefore, respectfully recommend:

"First—That such action be taken by the Health Board as seems necessary and proper to at once secure the provision of hospital accommodations, under its charge, for the care of the poor suffering from pulmonary tuberculosis, who, as active sources of danger to the community, may properly come under its supervision.

"Second—That an amendment be made to the sanitary code declaring that tuberculosis be officially considered a communicable disease, and formulating regulations under which its sanitary surveillance shall be exercised.

"Third—That all institutions in this city which admit and treat cases of pulmonary tuberculosis be subjected to regular and systematic inspection by officials of this board, and that specific regulations be established for the conduct of such institutions, in accord with the proposed amendment to the Sanitary Code.

"Fourth—That the scope of the measures designed for the education of the people in regard to the nature of pulmonary tuberculosis, and the methods to be taken for its prevention, be enlarged and a closer sanitary supervision be maintained over individuals suffering from this disease in the densely populated tenement districts, and in the crowded workshops and public buildings of this city."

The Ways of the Druids.*

The Druids considered no plant more sacred than the mistletoe, and the tree on which it grew, provided it was an oak. They chose groves consisting of oak trees only, and did not perform any religious ceremony without using the foliage of that tree, for they believed that everything which grew upon the oak was sent from heaven, and was a sign that the tree was chosen by God himself. But, as a matter of fact, the mistletoe was rarely found growing upon the oak, and when it was so discovered they repaired to the spot with great religious pomp. To begin with, they chose the sixth day of the moon, which was the first day of their month, their year, and their cycle of thirty years, because the moon has then considerable influence, though not as yet half full. They called the mistletoe in their language "all healing." When they had duly prepared sacrifices and a religious banquet beneath the tree, they led up to it two white bulls (of the same breed possibly as those now preserved at Chillingham Castle), whose horns were then for the first time bound. Then a priest, clad in a white vestment, climbed the tree and with a golden reaping hook cut the mistletoe, which was received in a white sagum (a Celtic term, apparently, for a cloak), after which they sacrificed the victims, praying that God would make His own gift prosperous to those to whom He had given it. They believed that fecundity was granted to every sterile animal that drank a decoction of this plant, and that it was an antidote for all kinds of poison. (Pliny, 16, 95.)

The Druids also possessed an amulet called the "serpent's egg," and they gave the following account of the manner in which it was produced: In summer time numberless snakes rolled themselves into a knot, and by skillful intertwining formed a ball with the saliva of their mouths and the foam of their bodies. This ball was cast high into the air with violent hissing, and had to be caught in a sagum before it reached the earth. The person who caught it galloped away on horseback, for the snakes pursued him until they were stopped by some intervening river. A test that it was a genuine serpent's egg was that it floated upward against a current of water when encircled with a golden band. They also held that it must be taken at a certain phase of the moon. Pliny had seen one of these so-called eggs. It was the size of a small round apple, and its shell was formed of cartilage, thickly covered with small cavities, like those on the arms of a polypus. The Druids used it as a badge, and extolled its virtues for obtaining a successful termination to matters in dispute, and procuring access to royal personages. It is said that the Emperor Claudius once killed a Roman knight, belonging to the Gallic tribe of the Vocontii, because he was so superstitious as to wear a "serpent's egg" in his bosom during the progress of a lawsuit in which he was engaged. (Pliny, 29, 12.)

Cicero had actually seen a Druid in the flesh, for he represents his brother Quintus as reminding him that he had received as his guest at Rome the celebrated Divitiacus, an Æduan who professed to be acquainted with the science which the Greeks called physiology, and to be able to foretell future events partly by augury and partly by conjecture. ("De Divinatione," 1, 41.) The Emperor Claudius finally suppressed the Druidical religion in Gaul. Its rites had already been forbidden to citizens in the reign of Augustus. (Suetonius, "Life of Claudius," 25.) The Druids were thus deprived of all political influence in the state. But although their organized system was broken up, the members of the religious society were still held in great esteem by the people for their knowledge of futurity, and in the year 70 A.D. they were again stirring up the Gauls to revolt against Rome by declaring, in their vain songs, that the oracles portended the empire of the world to "Transalpine" nations. (Tacitus, "Hist.," 4, 54.) In later times those who claimed to belong to the ancient order seem to have been for the most part females in a humble class of life, who professed to tell fortunes. Women were no doubt treated with more indulgence than men, as being less likely to use their power for political purposes. When the Emperor Alexander Severus was on the march through Gaul in 235 A.D., shortly before he was assassinated by some of his own troops, a Druidess (druias) met him and called out in the Gallic language, "Go thy way, but hope not for victory, and trust not thy soldiers!" (Lampridius, "Life of Alexander.") The Emperor Aurelian once inquired of some Gallic Druidesses whether the imperial power would remain with his descendants, and obtained the answer that the name of none of his descendants would be more famous in the state than that of Claudius. (Vopiscus, "Life of Aurelian.")

Again, when Diocletian was serving as a private soldier in Gaul, he lived at a tavern kept by a Druidess in the Tungrian country (Tongres). One day, as she was making out the bill for his daily board, she said to him, "Diocletian, you are too covetous, too sparing." He laughed and answered, "I will be liberal enough when I am emperor." "Don't jest," replied the Druidess, "for you will indeed be emperor when you have killed the boar" (aper). Diocletian, bearing this prediction in mind, was always intent on hunting the boar, and endeavored, whenever the opportunity occurred, to kill it with his own hand. But when he repeatedly saw others made emperor before him he used to remark, "I kill the boar, but some one else always eats the flesh." When in 284 A.D. he was chosen emperor by the army, his first act was to slay Arrius Aper, the murderer of his predecessor in the purple, exclaiming, as he plunged the sword into Aper's body, "At last I have slain the fatal boar!" and so was fulfilled the prophecy of the Gallic Druidess.

* From an exhaustive article entitled "Druidism," by T. H. B. Graham, in the Gentleman's Magazine.

The Lowell Observatory to go South from Arizona.

The Lowell Astronomical Observatory, which was established at Flagstaff, Arizona, in 1894, for the study of planets, especially Mars, is in process of removal to the city of Mexico. The lenses of the great telescope have been removed and the machine is being taken down to be shipped in a few days, says the New York Tribune. The object in going south is to secure good views during the winter months, and the experts who have studied the question say this can be obtained in the Mexican plateau, which lies within the tropics and has an elevation of about 8,000 feet over the sea level.

The observatory was in active operation there during 1894 and 1895, and many hundreds of fine drawings were made of Mars, the results showing that our neighboring planet is covered with an extensive system of canals, arranged in artificial manner, as if the work of intelligent beings. These researches were made by Profs. Lowell, Pickering and Douglas, and have attained world wide fame. Prof. Lowell's discoveries induced him to order a new 24 inch telescope from Alvan Clark & Sons, with a view of prosecuting these studies still further. The new telescope has been in use since August, 1896, and many new discoveries have been made. The work has been centered upon the planets and southern stars. Profs. Lowell and Douglas have continued their observations of Mars, while Prof. Lowell and Mr. Drew have worked on Mercury and Venus during the daytime. In the clear air of the afternoon these planets have shown conspicuous markings, and the astronomers have been able not merely to make maps of their surfaces, but to prove conclusively that the bodies rotate only once in the course of a revolution about the sun. One face of the planet is, therefore, turned toward the sun and heated to an immense temperature, while the other is wrapped in everlasting night. The markings down by Lowell have settled the question of the rotation of Mercury and Venus, which had been partially studied by Schiaparelli some years ago.

Prof. Lowell finds that Mercury has an appreciable atmosphere, while Venus has an abundance of it, but, for some reason, she possesses only a few clouds. Drawings of her markings have been forwarded to the Royal Astronomical Society in London. Dr. T. J. See and Mr. Cogshall have used the new telescope on the southern double stars, and it is announced that since August 1 they have discovered 50 new stellar systems, besides measuring 100 stars recognized by previous observators.

Russia Takes American Armor Plate.

The Bethlehem Iron Company has received from Russia particulars of a very successful test there of the company's armor plate. The tested plate was one representing 1,500 tons of Harveyized nickel steel side armor for the Russian battleship Rostivlov, all of which will now be accepted. The company has received a contract for making the shaftings and engine forgings for two big cruisers for the Japanese government.

THE Hon. Carroll D. Wright, U. S. Commissioner of Labor, has been chosen President of the American Statistical Association. The position was left vacant by the death of Gen. Francis A. Walker, who had been president of the association for fourteen years.

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Recent Archæological News.

Over four hundred diamonds are known to have been recovered from the ruins of Babylon. Many are uncut, but most are polished on one or two sides.

Permission to excavate the site of old Corinth, between the Acrocorinthus and the modern city, has been granted to the American School at Athens by the Greek government.

At the fiftieth anniversary of the French School at Athens, a performance of "Œdipe Roi," with Mounet-Sully and the Comédie Française company, will be given in the theater of Dionysos.

Prof. Homolle thinks that the copper statue recently exhumed by French scholars at Delphi represents Hiero, tyrant of Syracuse, and was probably made by Onatas, the teacher of Phidias; in which case the value of the statue would be equal to that of the Hermes of Praxiteles.

An important find of skeletons of prehistoric people, supposed to be cliff dwellers, was made recently on Beaver Creek, Yavapai County, Ariz. The skeletons were laid out in orderly arrangement on natural shelves in the chalklike cliffs bordering the creek. There were about forty skeletons in all, and each was laid on a piece of matting. They were evidently of full-grown people, but were very small in size and were in a remarkably good state of preservation.

An uncial Greek codex of the Gospels, recently bought by the Emperor of Russia from the village of Sarumsahly, northeast of Cæsarea, written on fine violet parchment in silver letters nearly an inch high and dating from the fourth century after Christ, is believed to be the manuscript known to New Testament scholars as N, of which thirty-three leaves are kept at Patmos, six in the Vatican, four in the British Museum, and two at Vienna. The Czar's copy is said to lack thirty-six leaves.

The common Greek method of reckoning distances, both by sea and land, was by computation, not by measurement, says Architecture and Building. A journey or voyage took a certain number of days, and this number was reduced to stadia, by allowing a certain number of stadia to each day's journey. The number of stadia so allowed was computed on the supposition that circumstances were favorable to the traveler's progress; and therefore every impediment, such as winds, tide, currents, windings of the coast, a heavily laden or badly sailing ship, or any deviation from the shortest track by sea and the corresponding hindrances by land would all tend to increase the number of days which the journey took, and consequently the number of stadia which the distance was computed to contain. These circumstances, together with the fact that the Greek writers are by no means agreed as to the number of stadia contained in a day's journey, and other sources of inaccuracy which we know to have existed, furnish a satisfactory explanation of the discrepancies which we find in their statements of distances, both when compared with one another and when compared with the actual fact, without there being any occasion to resort to the supposition of a stade different from the Olympic. Col. Leake also came to the conclusion that "the stade, as a linear measure, had but one standard, namely, the length of the foot race, and which is very clearly defined as having contained six hundred Greek feet."

Mount Kenia Ascended.

Late in 1895 Mr. George Kolb, a German explorer, practically reached the top of the famous African mountain Kenia, which lies directly under the equator in East Africa, and which has never been ascended before, though several explorers have made the attempt. Mr. Kolb started from the east coast on this expedition in July, but the exact date when he accomplished the ascent of Kenia is not given in the account of it which appears in the October number of Petermann's Mitteilungen, says the New York Sun.

The noses, ears, and toes of some of the black men who made ascent with him were frostbitten, and it is a wonder that he was able to induce them to undergo so much suffering, for explorers have always found it very difficult to tempt the tropical negro above the snow line. His success was the more noteworthy because the natives at the foot of the mountain hold the summit in great awe. They told the explorer that an enormous snake lived at the top and no one who ascended the mountain ever came back. The summit, they said, had another terrifying guest, a devil, the brother of the snake, and between the two it was certain death to venture into the forbidden region. Most of Kolb's party would not ascend with him for love or money, but a few of the braver men were induced by tempting offers to see the white man through to the end of his enterprise.

Kolb attacked the mountain on the east side, and it took him over five days to reach the summit plateau. He was 6,000 feet above the sea when he began the ascent of the mountain proper, and so his total climb was about 12,600 feet. Near the base of the mountain is a large lake, called by the mountaineers Gunga Lake, about a mile across and teeming with hippopotamuses, who thrive there over a mile above sea level. There is no apparent outlet to the lake, but as its waters are perfectly fresh, it undoubtedly has an underground connection with some river. Lake Ntorobbo, a still larger body of water, was most unexpectedly discovered far up the mountain side on the third day of the climb. It is about two miles long and a mile and a quarter wide, and there are no hippos disporting in its waters, for it lies above the tropical zone, and a skimming of ice forms over its surface nearly every night.

Soon after passing this lake the limit of forests was reached, and then succeeded the zone of bamboos through whose thickets the little party cut their way until they finally emerged, late on the fifth day, upon the mossy slopes above. For a day they had been marching above the upper limit of the range of wild animals, but bees buzzed in the higher part of the forest zone, and two natives who had scrambled far up the mountain side were found collecting wild honey. They sold a part of their provisions to Kolb, and this perhaps saved his expedition from defeat, for he had been unable to kill any meat, and his supplies were running low.

On the morning of the sixth day the explorer started with ten men, confident that he would gain the summit that day. They left their tent behind and carried only blankets and food. The blacks were warmly clothed from head to foot. They had not been marching over an hour when, greatly to Kolb's astonishment, they suddenly emerged over the east edge of the slope and stood on a wide-spreading, oval plateau. This is the summit plateau of Kenia, and only two protuberances rise above it. The plateau is about twelve miles long from north to south and about five miles wide. About midway on its eastern edge rises Kisiruni, which can be seen from the base of the mountain, from where it looks like a great volcanic cone; but Kolb was surprised to find there no sign of a cone or crater, but merely an elevation there of the edge of the plateau. Ice and ice water were found here and there in the depressions of the plateau surface.

The whole day was spent in wandering over this plain, and at night the party camped at the edge of a glacial brook less than a mile and a half from Victoria peak, the ice-crowned pinnacle of Kenia at the west edge of the plateau. This had been seen and described by all the plateau climbers who had attempted to reach the summit from the west side. The plain over which Kolb had walked had a scanty covering of Arctic vegetation.

The tired party passed a very trying night under the cold sky. Some of the men were afflicted with mountain sickness, in the form of faintness, severe headaches, and nose bleed. Nobody could sleep. The temperature was considerably below the freezing point. They were 18,600 feet above the sea, and they were frost bitten, while three miles below them was the eternal summer. They kindled a little fire, but the flame was blue and feeble and gave out little warmth. A handful of cooked beans apiece was their evening meal. At midnight it was twelve degrees below the freezing point, and a light snow fell during the night.

The next morning the leader and four of his men went on toward Victoria peak, but they soon turned back. There was not a mouthful to eat in the camp, and it was folly to think of climbing the peak, whose summit rose 400 feet above them. Under the best of circumstances it would be difficult to climb those icy slopes. The peak rises from a narrow base and the gradient is very steep. It would be long enough before the party reached a place where food might be procured, and so they left the plateau and descended to the villages as fast as they could. Kolb says the ascent is not difficult from the east side, and he thinks that Victoria peak can be climbed.

The missionary Krampf discovered this snow mountain on December 3, 1849, and he saw it again two years later. It was visited in 1883 by Joseph Thomson, who saw it from the west side, but the hostility of the natives prevented him from ascending its wooded slope, and, in fact, he came only within about twenty-five miles of its base. In 1887 Count Teleki made the first attempt to ascend the mountain, starting from its western base. He attained an altitude of 15,350 feet. In 1891 Capt. Dundas attempted to ascend the mountain from the east, but the highest point he reached was only 8,700 feet above sea level. In 1893 Dr. Gregory succeeded in climbing the west side of the mountain to a height of about 17,000 feet, above which point he saw glaciers descending the mountain side. He says that Victoria peak is the central cone of a greatly denuded old volcano whose crater has long since disappeared. The glaciers once extended much further down the mountain than they do now. The whole mountain is a great volcanic mass nearly thirty miles in diameter at its base, through which the equator passes. The third largest of the known snow mountains of equatorial Africa is Mount Rowenzori, and no one has yet succeeded in getting to the top of it.

IT is said that patents for inventions which relate in any way to electricity are now refused in Turkey.

Science Notes.

Prof. Behring has been awarded the Rinecker prize, consisting of a gold medal and $250, by the University of Würzburg for his discovery of the anti-toxine treatment of diphtheria.

An ethnographical museum is to be founded at Buda-Pesth. The nucleus of the collection will be the objects exhibited in the ethnographical section of Millennial Exhibition.

An international botanical garden is to be established at Palermo under the direction of Prof. Borzi, of the university. It is hoped that the favorable position of the garden may attract foreign students.

The recent Commercial Travelers' Fair at Madison Square Garden, New York, is said to have netted the sum of $17,500, which amount has been paid into the building fund of the Commercial Travelers' Home Association at Binghamton, N. Y. The gold medal was presented to William Hoge, the originator of the idea.

In the Prussian estimates is a vote of 50,000 marks to the Ministry of Public Instruction for investigations with the Roentgen rays. The vote is justified by reference to the importance which the new discovery has been shown to possess in physics, anatomy, zoology, physiology, botany and other sciences. The grant will be used to enable institutes and certain men of science to procure the necessary apparatus and to defray the expense of exhaustive experiments.

Miss Lilias Hamilton, who is private physician of the Emir of Afghanistan, has succeeded in convincing her royal patient of the utility of vaccination, says the Medical Record. Smallpox ravages Afghanistan every spring, killing about one-fifth of the children. The Emir has decreed obligatory vaccination in all his states. The order has been given to construct stables and to raise vaccine heifers. Miss Hamilton has been deputed to organize a general vaccination service.

In the Journal of Physiology, Dr. L. Barlow has pointed out that before the laws of osmosis, deduced from the final osmotic pressure, freezing point, etc., can be applied to the explanation of biological problems, it is necessary to determine whether the initial rates of osmosis of substances bear constant ratios to their final osmotic pressures, and whether the presence of proteid substances in the solutions affects the initial rate of osmosis. The author has found that the initial rates of osmosis cannot be determined from observations of the freezing points of solutions, and that proteid substances, even when present only in minute quantities, markedly diminish the rate of osmosis.

M. Lavalard, of the Société Nationale d'Agriculture, has communicated the following note on the mean weight of horses to Le Chasseur Francais: Excluding ponies, which have an average weight of 440 pounds, the weight of horses varies between 660 pounds and 1,540 pounds. The weight of omnibus, train, and cart horses varies between 1,100 pounds and 1,540 pounds. The boulonnais and percheron horses, which are employed for the heaviest work, weigh between 1,760 pounds and 1,980 pounds. Horses attaining the weight of 2,200 pounds are rare. The weight of victoria and coupe horses, which is about the same as that of cavalry horses, varies between 990 pounds and 1,056 pounds. These weights are all for adult animals.

A Japanese scientist, Mr. Muraoka, says the English Electrical Engineer, believes that he has discovered that glow worms give off a radiation which is more paradoxical in its behavior than any of the "invisible lights"—Roentgen, Becquerel or other—that have been hitherto discovered. From what particulars are available, however, it looks as though another explanation of the matter were feasible; and the experiment cannot be checked or repeated just at present, anyway. The visible light from glow worms has no special peculiarities, and from what the writer has seen does not even present a particularly interesting spectrum. There is, however, a French observation—which also requires repetition—that the light of a glow worm will affect a sensitized plate through paper opaque to ordinary light.

The Imperial Institute, Edinburgh, has had brought to its attention some interesting phenomena relating to the method by which gold was originally deposited in auriferous quartz. On this occasion Mr. J. C. Johnson, of Adelaide, Australia, who has given great attention to the subject, exhibited specimens of non-goldbearing stones in which he had artificially introduced gold in interstices and on the face in such a manner as to defy detection, even by skilled experts. Some of these specimens were shown privately to several distinguished geologists, who expressed great surprise at the remarkable character of the same. It seems that the discovery, some years ago, that gold could be induced to deposit from its mineral salt to the metallic state on any suitable base, such as iron sulphide, led Mr. Johnson to experiment with various salts of gold, and by which he found himself able to produce the most natural looking specimens of auriferous quartz from stone which, from previous assay, contained no trace of gold; moreover, the gold, which penetrates the stone so thoroughly, assumes some of the more natural forms.

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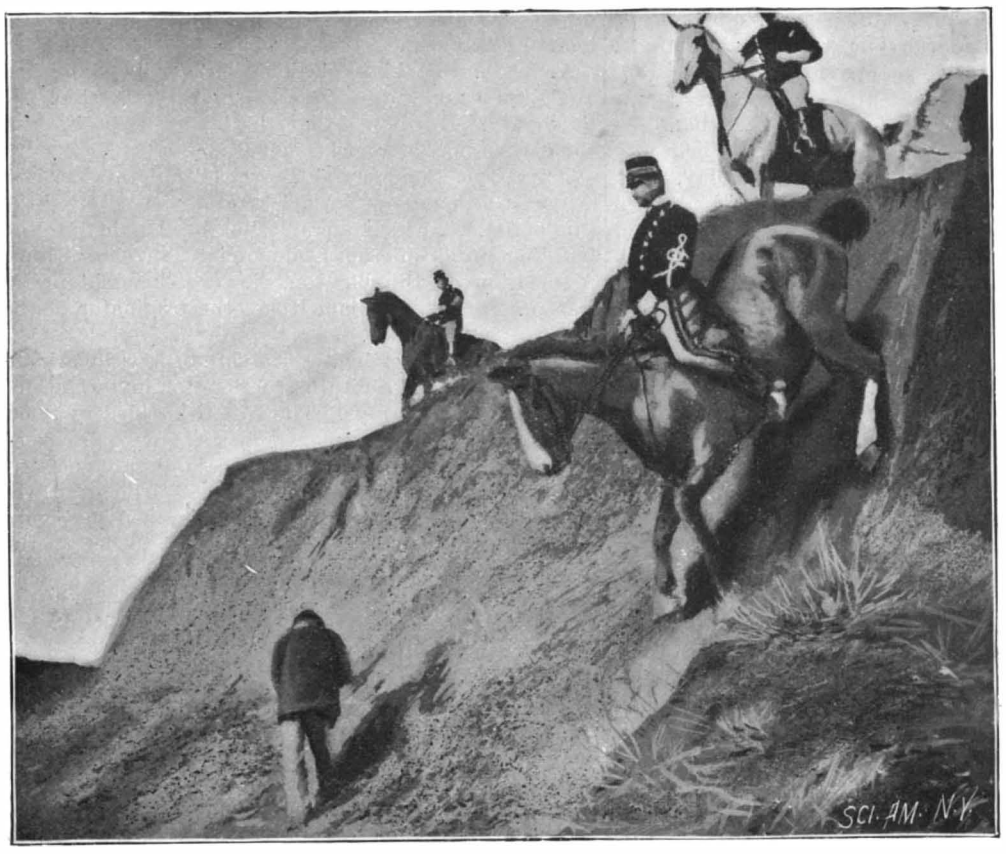
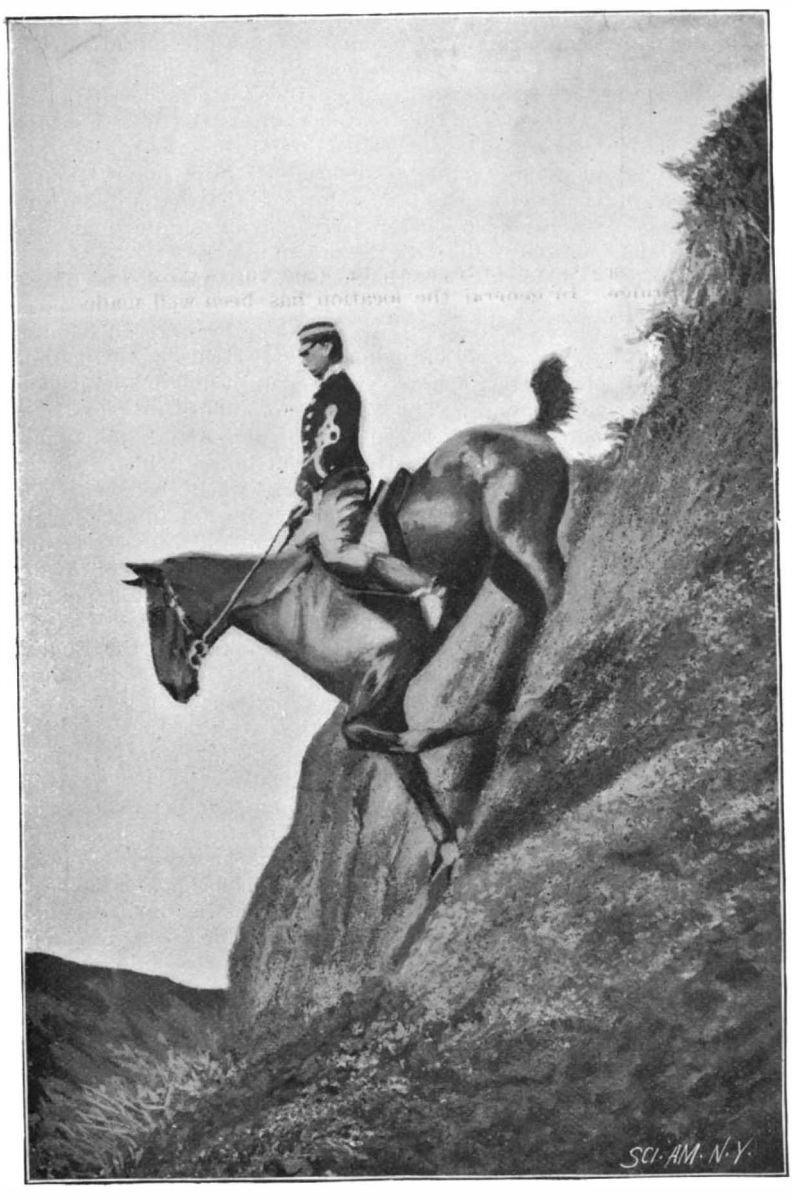
THE MILITARY RIDING SCHOOL AT TOR DI QUINTO.

Signor Sbisa, of Rome, Italy, has taken a series of instantaneous photographs at Tor di Quinto during the obstacle exercises and down-hill riding practice of the military riding school at that place. If an artist painted a horse in one of the surprising positions shown in the photographs, he would be severely criticised. This is because nowadays nature is not studied enough. The Greeks, however, who derived all their art from nature, have represented similar and other difficult positions of horses on vases of which wonderful specimens have been preserved. Some fine examples of equitation have been shown recently at Tor di Quinto. This beautiful suburb of Rome is universally known for its beautiful drives, but few know that it draws its name from the ruins of an antique tomb situated there. The painter Nicholas Poussin loved the scenery of the Campagna so much that he painted there many of his celebrated landscapes. For our engravings we are indebted to L'Illustrazione Italiana. In view of the very interesting exhibition of horsemanship shown by our own troopers recently at the Madison Square Garden, the methods of training cavalry in Italy will be viewed with interest.

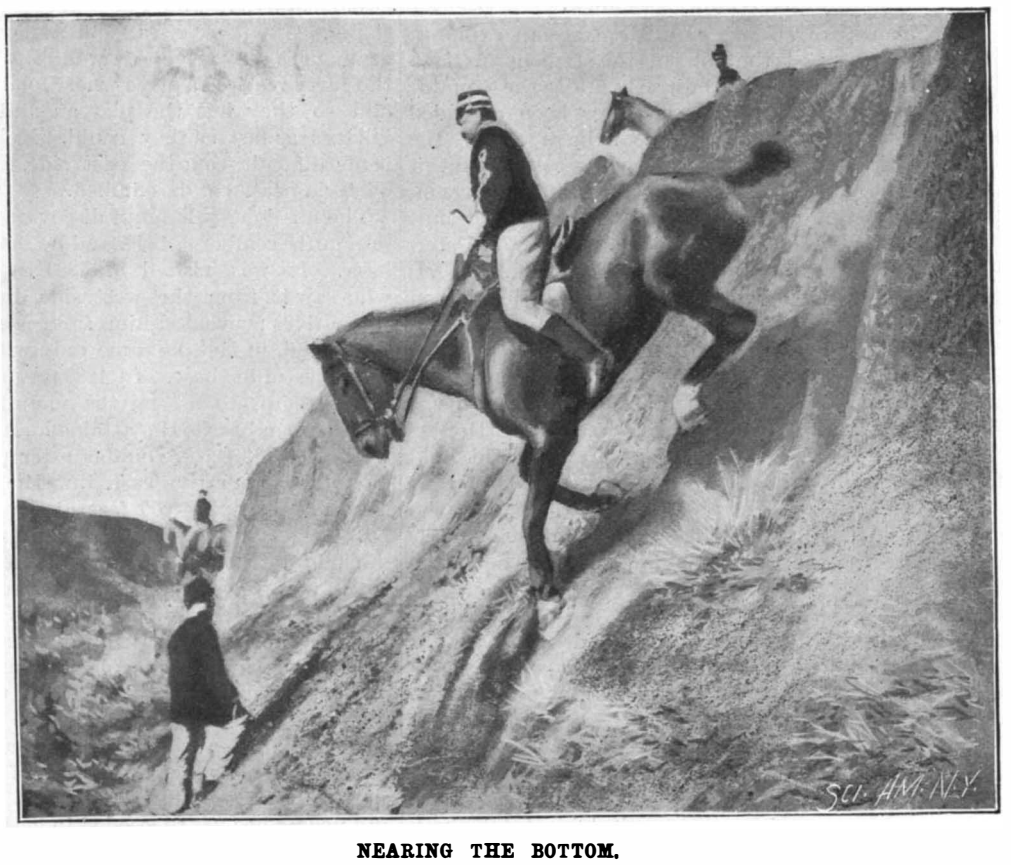


NEGOTIATING A DEEP CUT.



AN ANXIOUS MOMENT.

A POINT TO POINT STEEPLECHASE.



NEARING THE BOTTOM.

MILITARY EQUESTRIAN EXERCISES IN ITALY.

Growth of Diatoms.

Mr. G. C. Whipple has carried on a series of experiments on the culture of different kinds of diatoms, and finds that an abundant food supply is not the only condition favorable for their rapid increase; the temperature, the amount of light and other factors, influencing their growth. In common with all other chlorophyllaceous plants, diatoms will not grow in the dark, while, on the other hand, bright sunlight also kills them. The intensity of the light below the surface of the water being affected by the color of the water, diatoms are found most abundantly in light colored waters. Different genera, however, exhibit differences in this respect; Melosira does not require so much light as Synedra. The weather has a marked influence on the growth of diatoms; they increase most rapidly during those seasons of the year when the water is in circulation throughout the vertical. During these periods not only is food most abundant, but the vertical currents keep the diatoms near the surface, where there is light enough to stimulate their growth, and where there is abundance of air. Some species display strong heliotropism, moving toward the source of light.—Technology Quarterly (Boston).

Can a Frozen Animal be Restored to Life?

If the animal is slowly frozen and as slowly thawed out, life may be restored. If the freezing takes place at —5° C., the temperature then remaining at —2° C., there cannot be an aggravation of the condition. The temperature must be gradually raised, otherwise a fatal result will follow. The old plan, so prevalent in cold regions, of thawing out a frozen member of the body by rubbing with snow, before coming into a warm room, is based on scientific principles. Death follows at once if all the water contained in the body be crystallized. Complete congelation of the water of the body tissues signifies complete drying, separation of all the soluble and loosely chemically united gases, as well as crystallization of the salts. As a result of this, the structure of the protoplasm, as well as its chemical and physical characters, is necessarily destroyed. Death follows as the result of this separation of the living substance, and not as a consequence of great reduction of temperature. Water containing leeches can be lowered to —4·5° C. without the formation of ice within the tissues of these animals. Only when crystallization of the water surrounding the animals occurs, and extends into their richly watery tissues, do they die.

Animals whose tissues are rich in water may be frozen to stony hardness, but, as shown by macroscopic and microscopic examination, a sluggish, movable fluid may be seen coursing among the ice needles. Too long a time must not follow freezing before the efforts to restore life commence.—Medical and Surgical Reporter.

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THE HARLEM RIVER SPEEDWAY, NEW YORK CITY.

Among the many thousands of New York City who will benefit by the opening of the Harlem River Speedway, there are none who will welcome the event with greater enthusiasm than the admirers and owners of that distinctively American production the fast trotting horse.

It may be said that the contending claims of the city and the horsemen have operated to bring about the building of the Speedway. On the one hand there was the desire of the owners of fast trotters to have within easy reach of the city a level and straight stretch of roadway, unincumbered with traffic, on which they might speed their horses; on the other hand there was the on-rolling tide of a city's busy life, replacing fence and green meadows with curbstone and city "flat," and changing the elastic dirt road, so dear to the horseman's heart, into a Telford or Belgian block thoroughfare.

RAISED WESTERLY SIDEWALK, NORTH OF WASHINGTON BRIDGE, SHOWING RETAINING WALL, AND UNFINISHED ROADWAY AT GRADE.

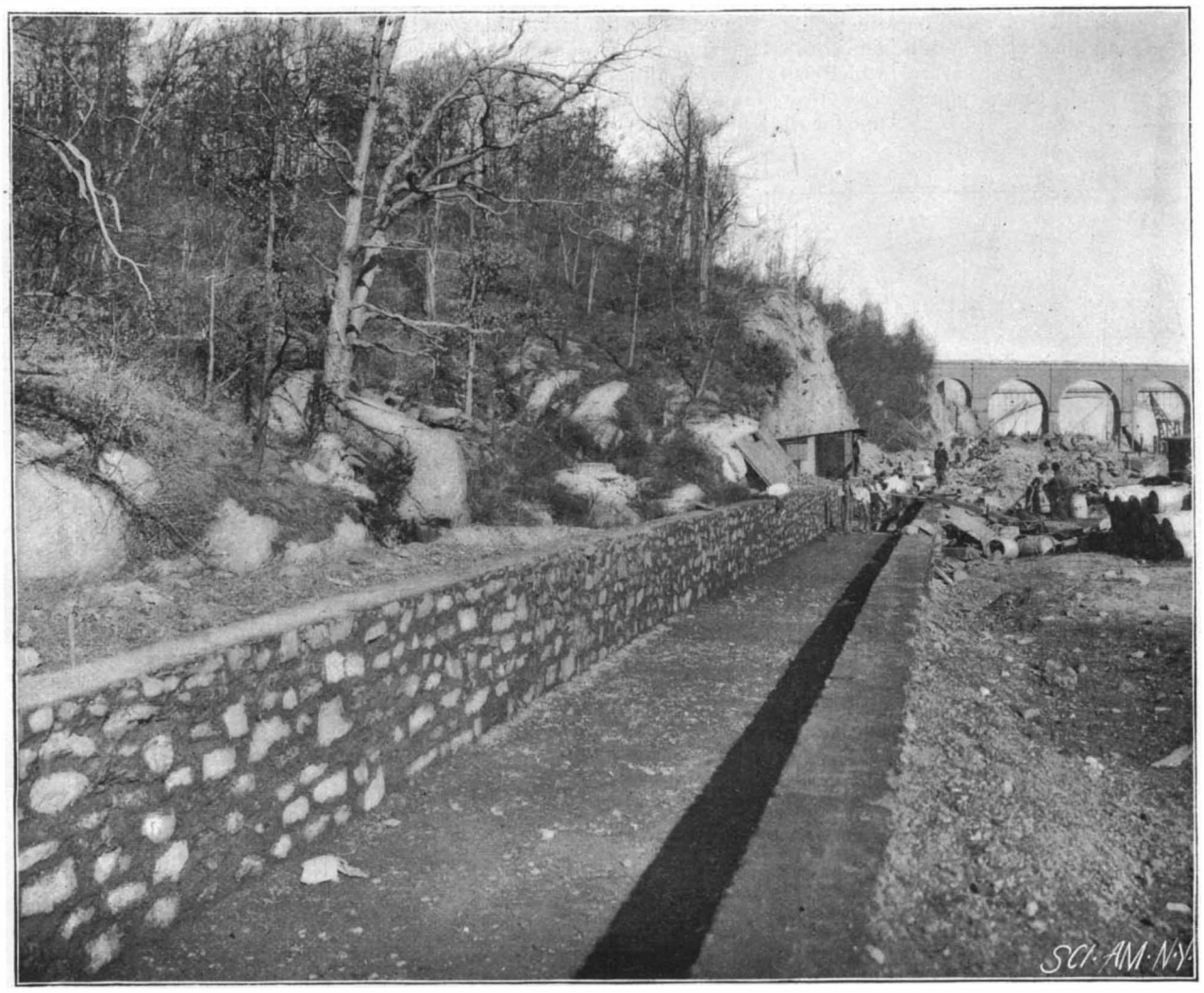
Many of our readers will remember the time when that part of Seventh Avenue which lies between Central Park and the Harlem River was the favorite speedway of the notable horsemen of the city. Here the finest trotting stock of the country could be seen of an afternoon, driven by such famous owners of fast horses as Commodore Vanderbilt, Colonel Kip, Frank Work, Russell Sage, Robert Bonner, owner of the illustrious Maud S., with many another zealous but less known horseman. Those who cared to would cross the old McComb's Dam Bridge and continue north along the road of that name, and many of the famous hostelries of that day may still be noted by the passing wheelman, their long, empty hitching sheds testifying in mute eloquence to a decayed or fast decaying sport. The Harlem Speedway owes its existence primarily to the efforts of the lovers of horseflesh; and it is to be hoped that the opening of the drive will go far to revive the waning interest in a noble and distinctively national pastime.

Judging from present indications, the Speedway will be completed in the spring of 1898, and, taken together with the recently constructed Lafayette Boulevard to the west of it on the bluffs of the Hudson River, it will provide the citizens of New York with one of the handsomest and certainly one of the most unique drives to be found in any great metropolis. The Harlem River and its surroundings, as will be shown later in the present article, are endeared to the people of the city, and indeed to all Americans, by the wealth of historic associations with which they abound; moreover, the shores of the two rivers are enriched with natural features of more than common beauty. Add to this that midway along its course the drive passes beneath two of the most notable engineering structures in America—the massive stone High Bridge and the Washington Bridge with its noble steel arches, the latter of which is the most handsome specimen of its type in existence—and it will be seen that the park commissioners have made a fitting choice in selecting this site for a work whose main object is to provide recreation for the public.

By reference to the small map on the front page it will be seen that the Speedway is laid out along the westerly shore of the Harlem River from One Hundred and Fifty-fifth Street to a junction with Dyckman Street, the total length being about 11,500 feet, or over two miles. It forms the eastern stretch of a circular driveway whose total length is approximately six miles, the western half, with which it will be connected by Dyckman Street, being formed by the practically completed Lafayette Boulevard, extending from the intersection of Dyckman Street and the Kingsbridge Road south along the banks of the Hudson River to One Hundred and Fifty-seventh Street. From One Hundred and Fifty-seventh Street an easy connection is made with the southern entrance to the Speedway by way of One Hundred and Fifty-fifth Street.

It should here be mentioned that the splendid driving facilities of Washington Heights are likely to be further increased by the extension of Amsterdam Avenue by a magnificent steel viaduct northward over Dyckman Meadows. An illustrated description of this structure will be found in the current issue of the SUPPLEMENT.

The prevailing design for the Speedway, which was only departed from where the limitations of the route demanded it, calls for a roadway 95 feet wide, flanked by two planting spaces 10 feet wide, one on each side, for shade trees, with an easterly sidewalk 20 feet wide and a 15 foot sidewalk on the west. The easterly limits of the Speedway were sharply defined by the government bulkhead lines, within which, except where it passes beneath the Washington Bridge, the outer walls have always been maintained. The westerly limits of the work have been fixed by the steep projecting bluffs of rock, into which it was desirable to cut as little as possible, every extra foot of width increasing the amount of excavation to enormous figures. This can be understood by reference to the great rock cut a thousand feet long to the north of Washington Bridge, where 160,000 cubic yards of solid rock were taken out, the depth of the cut at the highest point being fully 110 feet. Further limitations were imposed by existing structures, such as the gate house of the Croton Aqueduct and the piers of the two bridges above mentioned, the width of the roadway being narrowed down to 66½ feet where it passes between the piers of High Bridge. In general the location has been well made and, taken with the improvements on the original plans which have been made by the new Board of Park Commissioners, and are being carried out under the superintendence of Mr. J. A. Lockwood, as engineer in charge, and Prof. William H. Burr, of Columbia College, as consulting engineer, the Speedway promises to be a credit to the city of New York, and certainly one of the handsomest among its public works.



HARLEM RIVER SPEEDWAY—UNFINISHED ROADWAY SOUTH OF HIGH BRIDGE, SHOWING SOLID MASONRY TRENCHES IN WHICH TO PLANT SHADE TREES.

The southern entrance to the Speedway is located where the One Hundred and Fifty-fifth Street viaduct reaches the westerly bluffs of the high land to the south of Washington Heights. Here is also the point of interception of Edgecombe Avenue and St. Nicholas Place, both of which will have ready access to the drive. For the first half mile the roadbed falls on a four per cent grade to its river grade, six feet above mean high water. It follows the face of the bluffs and lies partly in cut and partly in fill, the material that has been blasted from the cliffs being utilized for the fill, which is held in place by a heavy retaining wall of broken range masonry. This is the most massive piece of masonry in the whole work, and involved the laying of no less than 15,000 cubic yards of stone.

At the foot of the grade the roadway

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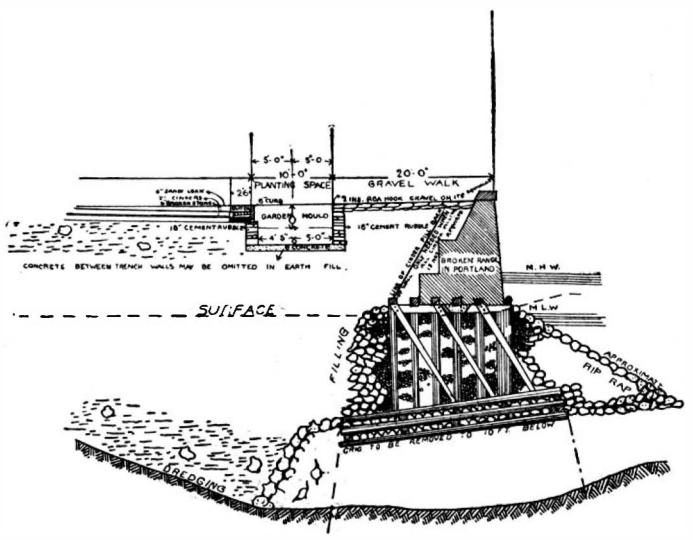
widens out to a width, from curb to curb, of 160 feet, in order to accommodate what is known as a "turnabout," where the horsemen who may not wish to leave the Speedway may return without climbing the grade to One Hundred and Fifty-fifth Street. The center of the "turnabout" will consist of a circle forty feet in diameter, which will be planted with trees and shrubbery. At this point will also be located the first of the three subways, the other two being built at High Bridge and Washington Bridge. These subways are built to enable foot passengers to pass from one sidewalk to the other without crossing the Speedway, a necessary provision where the roadway is devoted to fast driving. The first subway is built through the roadbed where it consists of a heavy fill, and consequently the side walls are carried upon piling, which is driven through the softer material to solid bottom. The piling is three feet from center to center, the spaces between the tops of the piles, for a depth of several feet, being filled in with cobblestones. Upon this foundation concrete walls are built up to the level of the floor, which is carried upon a brick arch. Above the floor the subway walls are built of dressed limestone and carry an arched granite roof. The details of the stairways will be massive and simple, to harmonize with the general features of the work.

It should be mentioned that the first half mile of the roadway is to be finished with a first-class Telford surface in place of the "dirt road" which it was originally intended to build for the whole two miles of the Speedway. This is one of the improvements which have been made by the new Park Board, and it will give a more durable surface on the four per cent grade, where the traffic and the weather will produce most wear. In general, however, the surface will be made to conform as far as possible to a country road, the macadamized road being considered by horsemen too hard for the fast driving for which the Speedway is intended. It is built as follows: The roadway is filled in with clean material to within a foot of sub-grade. Above this is laid clean earth, with no stones in it over three inches in size. This is rolled with a two ton roller. Above this is laid eight inches of stone, of a size that will pass through a two inch screen but be retained by a one inch screen. This layer is rolled with an eight ton roller. Then follows a two inch layer of cinders, rolled with a two thousand pound roller. Above this are two four inch layers of sandy loam, each of which is rolled with a two ton roller. The result is a firm but elastic surface, admirably adapted to fast driving.

From the foot of the grade the roadway has a slight rise to High Bridge, which marks the termination of the first section (or about one-half) of the work. The easterly walk, which in general is twenty feet wide, is at the same grade as the roadway, but the westerly walk rises and falls with the contour of the ground, in one place being twenty-eight feet above the surface of the roadway. In such cases it is carried by a retaining wall, as shown in the accompanying illustration. While this arrangement was necessitated by the natural features of the site, it will certainly add to the picturesque appearance of the driveway.

Some of this work as originally carried out failed to stand, and slid out into the river. Wherever this occurred the old cribwork is being dredged out preparatory to building a solid masonry bulkhead wall upon a pile foundation. Among other improvements introduced by the Park Board upon recommendation of the board of experts, masonry retaining walls and bulkheads have been built in place of the timber cribs wherever it was possible, a change which affects 1,600 feet out of the total 8,500 feet originally contemplated.

Of all the improvements introduced by the Board the most commendable was the provision for giving the Speedway landscape treatment. By an extraordinary

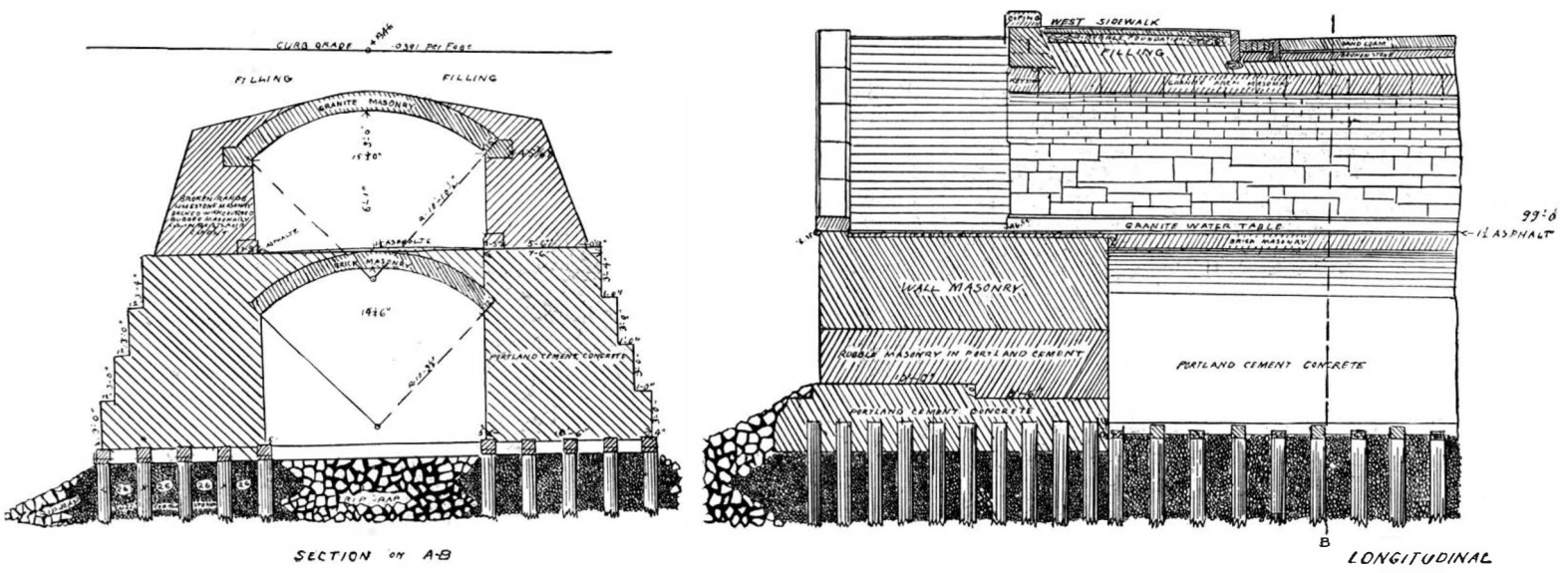


CROSS SECTION SHOWING CONSTRUCTION OF MASONRY TRENCH, SIDEWALK, BULKHEAD AND CRIB, HARLEM RIVER SPEEDWAY.

oversight, under the original contract no provision had been made for planting trees and shrubbery, an omission which would have produced a very bald and unfinished effect on a roadway of such wide proportions and containing long stretches of masonry retaining wall and asphalted sidewalks. It was determined to provide planting spaces ten feet wide on each side of the roadway, wherever the width of the site would permit, and fill them with shade trees and shrubbery. As under the original contract no landscape treatment had been contemplated, the roadway had been built with any kind of material that was suitable for filling, and as one contractor had a large amount of cinders available, the fill in places consisted largely of this material. To provide a suitable soil for the trees it was decided to lay trenches and fill them with garden mould in sufficient quantity to support the trees when they should attain their full growth. The idea was a good one; but the method of carrying it out, as will be seen by reference to the photographs and the small sectional view, was as extravagant as it was extraordinary. A solid, compact masonry and concrete box was built in which to place the mould. The walls are ten inches thick, and the bottom consists of eight inches of concrete. This trench, which will be practically watertight and without the least provision for drainage, extends in an unbroken line for thousands of feet, and within its close confinement the roots of the future shade trees of the Speedway are destined to rot in winter and bake in summer, "cribbed, cabined, and confined" beyond any chance of expansion, and in violation of the very first principles of vegetable growth. How the responsible parties who have done so well in the general work of revision and reconstruction should have committed themselves to such a piece of extravagant folly as this, passes comprehension. Further reference to the matter will be found in our editorial columns.

Some idea of the extent of the work on the first section is gained from the total estimates of the work done to date, which include, in addition to the 15,500 yards of masonry in the first retaining wall, 15,700 yards of masonry in subways and bulkheads; 2,186,000 cubic feet of cribwork; 147,000 lineal feet of piles, and 216,000 cubic yards of filling.

(To be continued.)



LONGITUDINAL AND CROSS SECTION THROUGH PASSENGER SUBWAY, HARLEM RIVER SPEEDWAY.

About half way between One Hundred and Fifty-fifth Street and High Bridge occurs the first stretch of timber cribwork. This class of construction was adopted wherever the roadway had to be carried across the small bays of the river. The mud of the river was first dredged out to hard bottom, which, on this section, was reached at an average depth of twenty-eight feet below low water. The first layers of the crib were then sunk by loading with rock, and the structure raised to the required height and filled in with broken stone or such as one man could handle. The outer wall is formed of 10×12 sawed timbers, laid with broken joints and strongly drifted together.

Jumping Cocoons.

The curious movements of jumping beans have lately attracted some attention, though to style the spasmodic jerks of the beans jumps is to court disappointment. Some "jumping cocoons," described by Dr. D. Sharp in the Entomologist, were, however, remarkably good athletes, for they could spring out of a small vessel, such as a tumbler, in which they were placed. These cocoons were from South Africa, but in spite of their exceptional gymnastic efficiency, Dr. Sharp hardened his heart and sacrificed them upon the altar of science, in the hope of discovering something unusual that would explain the power of jumping. The cocoons looked like a piece of oval pottery, about five millimeters long, and having a rough surface. In each of the two investigated a pupa was found; the two were similar in every respect, and they no doubt belonged to the larvæ that made the cocoons. "This little pupa," says Dr. Sharp, "is shut up in a remarkably hard thick cocoon, and it has to get out. Nature has not provided it with caustic potash for the purpose, but has endowed it with a mechanism of complex perfection to accomplish this little object. On the front of the head it has a sharp chisel edge, and with this it has to cut through the pottery; contracting itself to the utmost in the posterior part of the cocoon, and retaining itself in this position by the hooks on the mobile part of the body, it is in a condition of elastic tension in consequence of the other side of the body being so differently formed and immobile; therefore, releasing the hold of the hooks, the pupa is discharged forward, and the chisel piece strikes the front part of the cocoon; repeating this an enormous number of times, a circle may be gradually inscribed on the inside of the far end of the cocoon, which gives way when sufficiently weakened, and the insect becomes free. In both the specimens the inside of the cocoon is about half cut through; either this is done as the result of a prolonged series of wriggles, or of shocks such as I have described. It is by no means improbable that the early part of the performance is carving the groove by wriggling, the later part knocking it off by jumping against it." The pupa is thus a most interesting one to entomologists, says Nature. The order of insects to which it belongs appears to be somewhat uncertain, but Dr. Sharp thinks it will prove to be an anomalous lepidopterous insect allied to Trichoptera, and possibly somewhere near to Adela.

A Weather Observatory on Mont Rosa.

The success which has attended the installation of a meteorological observatory on the summit of Mont Blanc has stimulated Italian men of science to crown Mont Rosa with a similar edifice, says the Practical Engineer. It is intended to utilize the hut on the Gniffetti peak, built three years ago as a shelter for climbers. Situated at a height of about 14,000 feet above sea level, it will, as regards elevation, rank fourth among the twenty-seven mountain observatories of the world, being surpassed in altitude only by those of Arequipa, Mont Blanc, and Pike's Peak.

THE council of the Royal Colonial Institute have sent a memorial urging the British government to take early steps for the unification of time at sea. The memorialists say that the question is the simple one of the desirability of advancing astronomical time by twelve hours, so as to harmonize it with civil time, for nautical time has in general practice long been assimilated to civil time.

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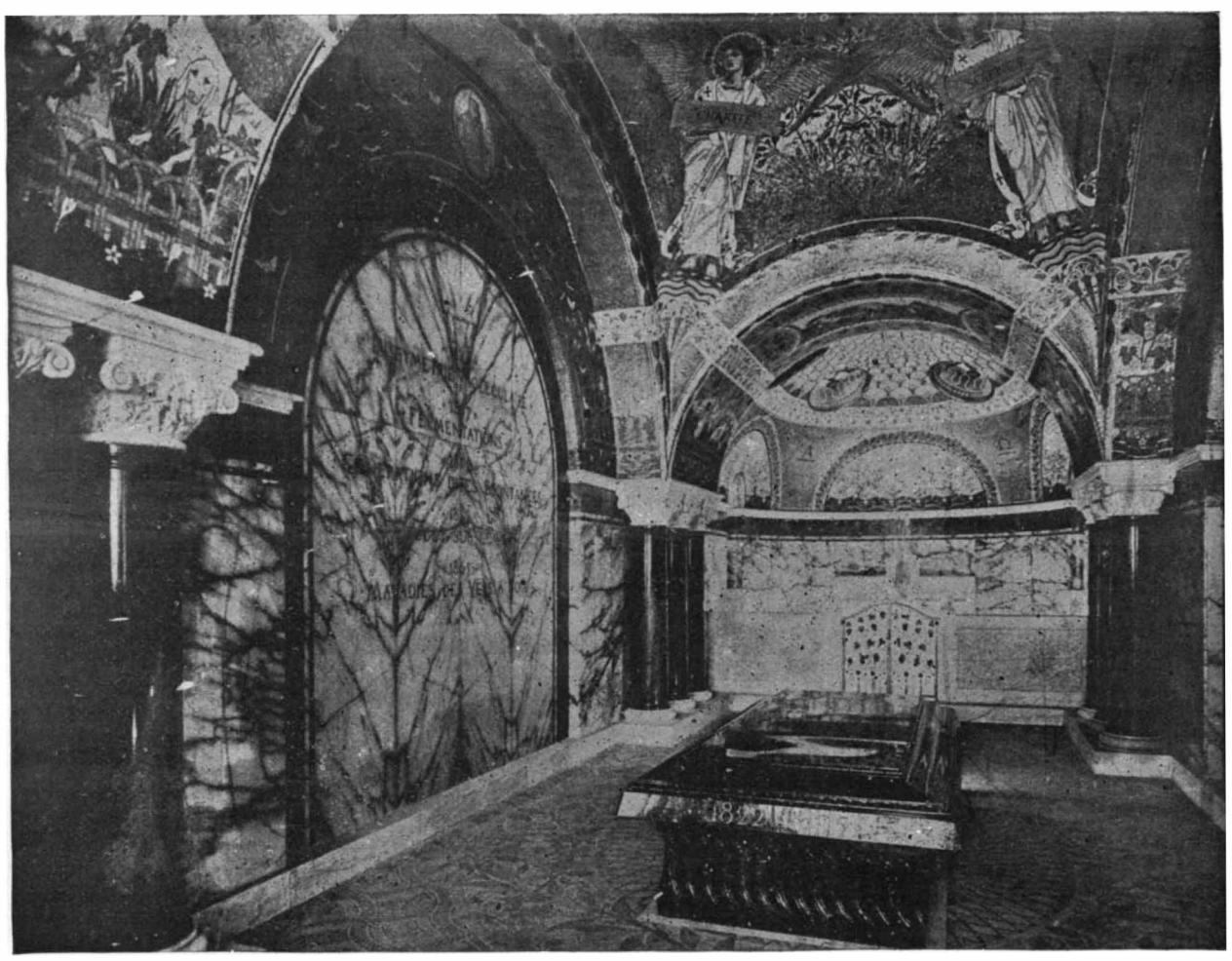
THE TOMB OF LOUIS PASTEUR.

We are able to present to our readers a description of the tomb erected in the Pasteur Institute for the remains of Louis Pasteur. A reproduction of a photograph of the mausoleum of the great French savant has been secured through the kindness of Monsieur J. B. Pasteur. This tomb ought to be visited by every medical man who has an opportunity of doing so, not only on account of Pasteur's great services rendered, directly and indirectly, to medicine and surgery; not only on account of the great interest attached to a visit to the laboratories of the institute, which may be made at the same time, but because the mausoleum is well worth seeing as a beautiful work of art, exquisite in taste and design and perfect in the finish of the workmanship. The Pasteur Institute is an imposing building situated in its own grounds in the Rue Dutot, but as it may not be easy for those to whom Paris is not well known to find it, the best plan is to drive there; a carriage from the Place de la Concorde will reach it in about half an hour.

The mausoleum is built at the end of a long corridor in the institute and is shut off by magnificent gates of wrought iron. Before describing it, it is interesting to note that it was built by the Pasteur family, and Monsieur J. B. Pasteur, the son of the great savant, suggested as a model the well known tomb of Galla Placidia, at Ravenna, which he had visited in the course of his travels in Italy. This tomb was built about 440 by the Christian Empress Placidia, the daughter of Theodosius the Great. It is in the form of a Latin cross 49 feet long and 41 feet broad, and we may refer to it in some detail to show how it inspired the architect of Pasteur's tomb, Monsieur Girault. The interior of Placidia's tomb is covered by mosaics, on a blue ground. Above the entrance are garlands of fruit and foliage; and in the dome the symbols of the evangelists. In the four arches which support the dome are figures of eight apostles, and between them is seen the familiar representation in mosaics of doves drinking out of a vase. Under the vaulting of the right and left transept are the other apostles and, between them, stags drinking at a spring in the midst of golden foliage. There are also designs in mosaic of branches of vines; and two subjects, full of grace and dignity, the chef d'œuvres of Christian art in the fifth century, the first representing the Good Shepherd with his sheep, and the second representing the triumph of the Christian faith. The altar is constructed of oriental onyx, and behind it is the large marble sarcophagus, which was at one time enriched with plates of silver.



TOMB OF LOUIS PASTEUR AT THE INSTITUT PASTEUR.

Turning now to the Pasteur mausoleum, we find the archway over the gates decorated in mosaic with irises on a gold ground, and there is also the simple inscription, "Ici repose Pasteur," and on either side of it the dates of his birth and death—1822–1895. Passing through the gates, the crypt is approached by a flight of nine steps of white statuary marble. The pavement of the crypt is of marble mosaic on which are represented large wreaths of laurel. The crypt is formed by four arches which support a cupola, and in the center is placed the sarcophagus, which is carved out of a single block of dark green porphyry. The arches are supported on four groups each of three columns, two of green porphyry and one of red, with Byzantine capitals of white marble. The walls of the crypt are lined with pavonazza, a cream colored marble richly veined in black, and above it are beautifully executed mosaics. On the marble which fills the arches on the right and left are inscriptions indicating Pasteur's discoveries in historical order as follows:

1848. Dyssymétrie Moléculaire.	1871. Etudes sur la Bière.
1857. Fermentations.	1877. Maladies Virulentes.
1862. Générations dites Spontanées.	1880. Virus Vaccins.
1863. Etudes sur le Vin.	1885. Prophylaxie de la Rage.
1865. Maladies des Vers à soie.	

Beyond the sarcophagus is an apsidal chapel containing an altar of white marble inclosed by a balustrade of the same material. Above the staircase is the following inscription from the oration delivered at the reception of Pasteur into the Academy of Science: "Heureux celui qui porte en soi un dieu, un idéal de beauté, et qui lui obéit—idéal de l'art, idéal de la science, idéal de la patrie, idéal des vertus de l'Evangile." In the apse is another inscription containing the name of the architect and other interesting particulars: "Ce monument fut élevé en MDCCCXCVI. à la mémoire de Pasteur par la piété de sa veuve et de ses enfants. Charles Louis Girault composa l'architecture et la décoration; il dirigea les travaux. Luc Olivier Merson dessina les figures de la coupole. Auguste Guilbert Martin exécuta les mosaïques."

In the mosaics are representations of fowls, cattle, sheep and dogs, indicating Pasteur's researches on chicken cholera and attenuation of virus, on anthrax, on clavelée or sheeppox, and on rabies. There are also beautiful designs of hops, vines and mulberry trees with silkworms and moths, illustrating respectively his researches on the so-called diseases of beer and wine and on the silkworm disease. Pasteur was a devout Roman Catholic, and the religious side of his character is indicated in the mosaics by angelic figures of Faith, Hope, Charity and Science, and, above the altar, by the figure of a dove descending, representing the Holy Spirit, and on either side the Greek letters A and Ω. At the top of the cupola light is admitted through slabs of oriental onyx.

Such is the magnificent resting place of Louis Pasteur, and it was a happy idea that this tomb should be placed where his successors carry on his great work, and where students from all parts of the world may be reminded of the example he set of a life of untiring devotion to science and humanity.

We are indebted to the Lancet, of London, for the cut and particulars.

Helping Others to Help Themselves.

There is no better philanthropy, no higher and wiser way of being truly charitable, than to help others to help themselves. This is everywhere acknowledged by all who have earnestly sought, in either a large or a small way, to benefit their fellow beings. What could be more practical, therefore, what more promising of good results, than a method recently put in practice by two New York ladies, by which all of the New York City police stations, and the houses of hook and ladder and fire engine companies, were regularly supplied with the SCIENTIFIC AMERICAN? Thirty-eight subscriptions were thus paid for by these ladies for the police stations and twenty-four for the fire engine houses. Subscriptions to the latter have been already paid for the year 1897. Those thus supplied with the paper are, of course, amply able to take and pay for such papers as they choose; but such a benefaction, so gracefully bestowed, comes as a cheering benison to be gratefully remembered by the recipients every week in the year. For both policemen and firemen have long hours of waiting at their stations, to be in readiness to answer the calls to active duty, and the waiting not only seems less long, but may be actually employed in a pleasurable, even profitable way, and perhaps to their own great advantage, when they may always have at hand a copy of the SCIENTIFIC AMERICAN to interest and instruct them.

Our Homes.

It is said that the sweet cantatrice and good woman, Jenny Lind, when she had been but a few days in America, asked, "Where are your poor people? I see so few who look and dress poorly, so few who appear to be without comfortable homes?" Of course, there are many poor homes here, but the Swedish nightingale was right in the thought which lay behind her question. The percentage of those who are comparatively well to do, the proportion of those who have comfortable homes—nicely furnished, well appointed, and perhaps even sumptuously supplied—is far higher here than in any other land.

In the Building Edition of the SCIENTIFIC AMERICAN, we think we can say without contradiction, are presented more houses and more attractive views, plans and details of dwellings, from the most costly to the most humble, than are to be obtained from any other source. It gives in every number, in colors and in beautiful half tones, fresh collections of views, made with photographic fidelity, showing recently built dwellings and notable structures of every description, with such ample explanations as to their various features that one can hardly help saying, in looking over its pages, "How I would like to have such a house! What a pretty dwelling this is! What a fine view there must be from that bay window!" or, "How comfortable it must be to sit on that balcony, looking out on the lawn, during warm summer evenings!" etc. And from such thoughts as these come questions as to cost, the consideration of what one can afford to do to own a home in accordance with this or that favored design, and upon these reflections follow closely calculations as to the minor changes one would have—a closet here, a bath room there, a niche in the hall perhaps for an arm chair, or a cozy corner off the drawing room for the children or for grandma. Then, too, come crowding in considerations as to the plumbing, the heating, the painting, the papering and wall finishing, the decorating, the lighting, and everything that must have or may have a place within or without the building.

And where else can all the questions which arise in such pleasant half reverie, half calculating mood be as fully and completely answered as in the pages of the Building Edition of the SCIENTIFIC AMERICAN? Besides its handsome original views and descriptions, its columns teem with the illustrated announcements of the most reliable manufacturers of every class of materials, goods and appliances required in buildings, and for their fitting up and furnishing. The subscription price is $2.50 a year, and when one has had the pleasure and profit of perusing each monthly number as it arrives, it is almost impossible for any reader to throw them away, as they would an ordinary serial, when for a slight sum they may be bound into a splendid large quarto volume, instructive and interesting to leave around and forming a valuable addition to any library. The price of these large and beautiful volumes, ready bound, is far less than that of most books of anything like the same cost to produce.

THE widow of Baron Maurice Hirsch, of Vienna, has decided to present 2,000,000 francs ($400,000) to the Pasteur Institute as a memorial of her husband. This gift will enable the building to be enlarged by the addition of chemical and biological laboratories.

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RECENTLY PATENTED INVENTIONS.

Engineering.

ROTARY GAS ENGINE.—John D. Blagden, Wood's Holl, Mass. In this engine a stationary central casing forms a compressed air reservoir, around and inclosing which revolves a cylinder with hollow trunnions and a rim forming a working chamber into which extends an abutment, the piston sliding radially and being withdrawn at the time the abutment passes the bearing containing the piston. The cylinder has an eccentric groove receiving a portion of the piston to actuate the piston in unison with the cylinder, and the motion of the latter is readily transmitted to other machinery by a belt. The valves controlling the ports for the admission of air and gas and the discharge of products of combustion have one full stroke to two revolutions of the cylinder.

FLUID PRESSURE MOTOR AND BRAKE.—John McIntyre, Jersey City, N. J. Two patents have been granted this inventor, according to one of which the exhaust fluid of the motor is utilized for applying brakes to stop the motor and car, while the other is mainly for a compound fluid pressure motor and a fluid pressure brake discharging into the low pressure cylinder of the motor, the inventions in both cases being designed to utilize the motive agent to the fullest advantage and reduce waste to a minimum. In using compressed air for propelling cars and actuating the brake mechanism, a large amount of power has heretofore been wasted by the motor in making stops, and at the brake mechanism by waste of fluid, both of which are avoided by the invention for which one of the patents is issued, as the exhaust of the motor actuates the brake mechanism to stop the car, and the brake mechanism is also used as a resistance to the moving piston to stop the motor without shutting off the live fluid supply. According to the other invention, for compound motor and brake, there is a valved connection between a fluid pressure brake and the high pressure cylinder of the motor, to actuate the brakes in applying and releasing them, and there is also a connection between the valved connection and the low pressure cylinder, to pass the exhaust from the brake cylinder into the connection and to the low pressure cylinder. A brake is interposed in the connection between the high and low pressure cylinders, and there is a third brake in the exhaust of the low pressure cylinder.

SAFETY GUARD FOR HOLLOW BODIES.—This patent is for a further invention of the same inventor, the guard being applicable to bodies containing gaseous and other fluids under pressure, to prevent damage by the sudden escape of the gaseous contents, should the body be ruptured or burst. The form of the guard may be greatly varied, but it consists in the main of an interior perforated shell, conforming in the main to the interior of the hollow body, but separated by a slight space therefrom, and the outer space being connected with the main inner space of the body by the perforations, rendering the guard normally pressureless. The improvement is designed to prevent the instantaneous escape of the body of the fluid should an explosion occur, and insure a slow reduction of the pressure.

Mechanical.

FRICTION CLUTCH. — Philip Steuerwald, Chicago, Ill. The simple, easily managed and durable clutch provided by this inventor has a brake shoe adapted to engage the inner surface of the pulley rim and a link is connected to the free end of the shoe, while a second link has a fixed fulcrum and a three-armed lever is connected at two of its arms with the links and at its other arm with a shifting device. The arrangement is such as to prevent the entanglement of the belt, should it slip off the pulley.

ROLLER BEARING. — Hubert Schon, Allegheny, Pa. This is a bearing designed for use on cars and other vehicles, and may also be employed on bicycles, rolling mills, etc. Between the axle and the brass or bearing box is an endless roller chain, rollers being journaled in the links of two chains, and the links being pivotally connected. The bearing has an under curved surface corresponding to that of the axle, and a curved top portion, while its ends are rounded, the roller chain traveling readily on these curved surfaces and rounded ends. The flanges of the bearing box prevent lateral shifting of the roller chains, and serve to fasten the box in position on a truck or other part on which the bearing is applied.

BOOK FINISHING MACHINE.—Daniel Nitschke, Toledo, O. For accurately and quickly lettering, filleting and stamping the back of any sized book with gold leaf, etc., this inventor has devised a machine in which the type holder is received in a block mounted to rock transversely, there being two clamping plates for the book and a slidable block having connection with the plates and sliding vertically as they are adjusted laterally. The machine is designed to do perfect work and save time and labor, the lettering on the back being automatically centered regardless of the thickness of the book and without any adjustment, it being impossible to give an uneven bearing on the type, and absolutely straight lines being produced.

SET GEAR FOR SAW MILLS.—John B. Hart, Clarksburg, West Va. For setting a log to be sawed in proper relation to the saw for the different thicknesses of lumber, this invention provides a mechanism whereby very fine adjustments may be obtained and the log be held with a positive grip. The gear comprises a flanged wheel on whose axis is fulcrumed an arm to which is pivoted a lever, there being jaws on the lever engaging the flange of the wheel, and a gripper engaging the wheel to prevent its backward movement. A sector with a stop limits the movement of the arm and lever, and the construction makes possible a much finer and greater range of adjustment than can be had with the common ratchet and pawl devices, or where a pin inserted in the holes of a quadrant is employed as a stop.

JOURNAL BEARING.—William J. Tripp, New York City. According to this improvement, two inner collars are adjustable toward and from each other and have their adjacent faces inclined to form a V-shaped bearing surface between them, while an outer ring surrounds the collars and has on its inner face a V-shaped bearing surface corresponding to the other bearing surface, a series of balls journaled on the axles running in the bearings between the outer ring and the collars. Rings made in sections and loosely connected at their ends are connected to the opposite ends of the axles and arranged parallel with each other. The bearing is adapted for use on bicycles and other vehicles and machinery, and is designed to reduce the friction of the bearing parts to a minimum.

Agricultural.

CORN HARVESTER.—Millard F. Myers, Greenville, and William C. Choate, Columbus, O. To harvest the corn from one or a number of rows at the same time, these inventors have perfected a machine in which the weight of the completed shock acts to dump the shocker, and the latter and its support are so constructed that the shocks are centrally concaved, causing them to stand more firmly on the ground, or their butts or bottoms may be inclined, so that they will stand upright on a hillside, The machine has but a single drive shaft for the platform conveyor and elevator, and the rear ends of the conveyer and elevator are open, permitting long stalks to be handled as readily as short ones. Reels feed the stalks to simple and effective cutting devices, the stalks being held upright, and guides are provided to pick up corn blown down or otherwise depressed. Simple and effective means are provided for tying the shocks in the shocker.

POULTRY BROODER.—Hiram W. Stoddard, Kearney, Neb. For confining and successfully raising young chickens, this inventor has devised a brooder in which the chickens are compelled or induced to take a certain amount of exercise to give them the necessary strength and hardihood, the device also promoting exercise in adult fowls confined in yards or buildings, especially breeding stock, causing their eggs to be fertile and productive of vigorous chickens. The invention comprises a novel construction of coop in which hay, chopped straw, chaff or forest leaves may be agitated to mix them with the food in the shape of cereals, compelling the chickens or fowls to scratch to obtain their food. It is also designed to have two series of feed boxes at a long distance apart and connected by runways, making it necessary for the fowls to exercise their bodies and wings.

Miscellaneous.

BICYCLE CHAIN CLEANER.—Eney Grupelli, New York City. According to this improvement, two circular brushes are journaled in a frame adapted to be secured to a part of the bicycle frame in such position that one run of the chain to be cleaned passes between the brushes, the device being of simple and inexpensive construction and readily attached to or detached from the bicycle frame. The device is attached to the bicycle frame by a clip, and is composed of a main frame made in parts, there being journaled in the frame a right and left hand screw rod engaged by nuts on shafts which carry the revoluble brushes, the latter being readily moved toward and from each other by turning a knob.

TROLLOCIPEDE.—Prier C. Smallwood, Louella, Mo. In trolley cycles for use with a suspended track or cable, this invention provides an improvement, and also in the tracks for supporting such vehicles. The U-shaped frame of the device carries wheels adapted to bear above and below the track, and one of the wheels is movable toward and from the other to overcome inequalities of the track. A novel form of forked brake shoe is employed to stop the trollocipede when in motion. The trolley track supports have arms each carrying a block which separates the strands of the cable, the blocks carrying housings which are connected to the respective strands of the cable.

WHEAT STEAMER. — William L. Mathews, Mariette, Mich. To thoroughly and uniformly steam grain, this invention provides a casing having a cap supporting a central feed pipe on which turns a regulating pipe, a series of annular hoppers one above another in the casing, a deflecting cone below and for each hopper, and an inverted cone in the lower hopper to prevent clogging. The steam is admitted at one side and near the middle of the casing, only dry steam entering and coming in contact with the kernels, while the grain is discharged from one hopper upon the next cone below and from this cone into the next hopper, the constantly moving grain being sufficiently retarded to insure the proper absorption of steam.

RADIATOR. - Frederick Bason, Chicago, Ill. This invention is for a heating apparatus in which both steam and water may be used, or either steam or hot water exclusively as desired. It has a series of connected loops through a number of which extend vertical steam leading pipes with open upper ends, steam being admitted to the radiator either directly to the loops or through the steam leading pipes. Any amount of water may be retained within the loops, causing the radiator to be exclusively a water heating apparatus or a part water and part steam heater. The invention may be applied to radiators not previously built for it, and the novel construction forms a radiator of very neat appearance.

AUTOMATIC FIRE EXTINGUISHER. — Edward Livingston. New Orleans, La. This invention is for an improvement on formerly patented inventions of the same inventor, and provides for the use of a fluid as the expellant of a fire-extinguishing fluid. The distributing pipe contains a fluid under pressure, and a vessel connected with a pipe contains the fire-extinguishing fluid held normally dormant. A diaphragm is connected with the pipe, and a valve closes the passage to the vessel while opening that to the diaphragm. Each of the pipes in the rooms protect d has one or more fusion valves adapted to open when the temperature exceeds about 160° F., when a connection is made, through the operation of the diaphragm and connected devices, whereby a tank containing a gas-generating substance is discharged into a vessel containing alkaline water, and the water and gas are passed through the fusion valves onto the fire.

FLEXIBLE LADDER. — Theodore W. Keithley, Montevideo, Minn. For use principally as a fire escape in hotels and other buildings, this inventor has devised a ladder which may be readily folded up and stored under a window to be ready for immediate use. It is made in sections flexibly connected with each other, each section being formed of a metal wire bent to form two sides, a rung, and braces extending from the sides to the rung. The uppermost section has short chains adapted to be secured to the window sill on the inside of the room, and the lower section has a horizontal bar on the rear of which are hinged arms to engage the face of the wall and hold the latter out a little from the building.

VEHICLE TIRE TIGHTENER.—Robert N. Garrett, Troy, Texas. According to this improvement two wedge-shaped sections are arranged to be fitted together between the tire and felly, to take up slack, each section having a thick and thin side edge and with shoulders adapted to engage each other on their opposing faces. The tightener may be made to completely encircle the wheel or for use in sections, the latter form being especially adapted for the repair of wheels on which the tire has become loose, while the continuous form is preferred for new wheels, when they may be so introduced as to obviate the necessity of shrinking the tire on the felly.

FIFTH WHEEL.—Alfred W. Johnson, New Brunswick, N. J. A device in which the weight on the fifth wheel is transmitted directly to the front axle, no matter what may be the position of the latter, is afforded by this invention. A frame is carried by the vehicle body and a second frame by the front axle, the first frame having at its rear two studs adapted to loosely engage a notch in the second frame, there being registering grooves in the front portion of the two frames. The grooves are angular and have reversed relation to each other, so that their sides will always be crossed to form an inclosure for an anti friction ball by means of which the body frame is supported on the axle frame.

SAILING VESSEL.—Ranald Gillis, Sydney, Canada. A novel movable keel which may be balanced to suit the conditions under which the vessel is sailing is provided by this invention. Rising from an opening in the bottom of the vessel, after the manner of the usual center-board wells, is a trunk within which fits and is held by a flange on its upper edge a keel consisting of a downwardly projecting shell, oval in horizontal section and tapering to a sharp edge at its lower portion. Fitted within the shell, and conforming thereto in shape, is a series of weights of different sizes, and having handles in their upper faces, whereby they may be removed or replaced as desired, according to the weight it is desired to carry in the center-board.

SWIVEL LEADER HOLDER.—George F. and Francis Breitstein, New York City. This holder comprises a stem and independently pivoted wings, one located at the center of the stem and the other connected with it near its ends, the holder having guides or wings to be engaged by the leaders, which bear such relation to one another that tension upon one will hold the other pointing in an opposite direction, and when more than one leader is attached to the holder the liability of the leaders becoming entangled is reduced to a minimum. The leaders may be readily attached to the holder without knotting or otherwise permanently tying them, and the device is simple, durable and inexpensive.

MOISTENING AND SEALING ENVELOPES, ETC.—Asahel W. Eddy, Coleridge, Neb. This invention is for a machine in which an envelope containing a letter or other matter may be introduced, when the gummed flap will be evenly moistened and sealed down, the letter leaving the machine ready to be stamped for mailing. Within a suitable casing is a moistening roller which receives the gummed flap while feed rollers receive the body of the letter, there being guide rollers at each side and an inclined partition crossing the feed rollers, sealing rollers being located at the lower end of the partition, and there being a driving connection by which all the rollers are simultaneously operated.

POCKET INK BOTTLE, PEN, ETC. — John Pool, Milparinka, New South Wales. According to this improvement, a case is provided with a series of compartments, in one of which a sheath for an ink bottle is removably seated, the cover having a pouch, and metal strips movable in guideways in the sheath forming feet when drawn outward. The device is for a pocket combination of pigment or powdered ink, a bottle for mixing and holding it, pen and pencil for writing, extra leads and nibs, and pouch for postage stamps, making these requisites conveniently available for a traveler.

THREAD CABINET. — John S. Armstrong, Burleson, Texas. To hold spools of thread of different sizes so that the spools may be readily taken out one at a time as desired, this inventor has devised a cabinet of novel construction, in which are a number of compartments, each having a swinging bottom wall extended through a front opening, a swinging spool receiver operated by the bottom wall, and means for automatically moving the bottom wall to its closed position. Each compartment is designed to contain spools of the same size, and there is a sight opening in the front wall by which it may be ascertained when the compartments need refilling.

WINDOW.—Mary West, Birmingham, Ala. This inventor, a daughter of ex-Governor W. H. Smith, of Alabama, has devised an improvement in windows according to which the sashes may be adjusted vertically and axially on a horizontal pivot. In the casing are vertical slots in which are movable bolts to which the sash are pivotally connected, weighted chains being also connected to the bolts, and a locking cleat slidable on the sash being capable of engaging the casement to hold the sash from rotation. A block flexibly connected with the sash is capable of engaging the locking cleat to hold it in position.

WATER STRAINER.—Joseph H. Seed, 21 and 23 Centre Street, New York City. This is a device more especially designed for use in the ordinary faucets on service pipes in buildings to purify the water in a simple and inexpensive manner. It has an upper portion to screw on a faucet and a lower portion forming an outlet or spout, and at the junction of these parts is a strainer formed of two semispherical sieves, made preferably of wire cloth of different mesh, and loosely inclosing a ball of agate or like hard, impervious material. To clean the strainer, the entire device is removed from the faucet and water is allowed to flow through it in reverse direction. The ball between the sieves prevents their collapse and breaks the impetuosity of the flow.

WINDOW SCREEN.—Charles I. Still, Sing Sing, N. Y. This screen is carried by spring rollers attached to the sash and opens and closes with them, being entirely out of the way so as not to obstruct the vision when the window is closed, but when the sashes are opened the screens assume their places to close the window opening. They may be attached to the ordinary window sashes without changing the latter, and are protected from the weather by a shield or guard which allows insects to pass outward but prevents their entry to the room.

SAD IRON HEATER.—Stephen Arleth, Holland, Mich. This is a device for use on gasolene, gas or ordinary cook stoves to concentrate the heat upon the irons, the latter being readily placed in or removed from the heater. It is made of copper or other sheet metal in the form of a square, shallow box without bottom, and may be lined with asbestos. It has an open front arranged to be closed by a flange of the lid, in which are openings for the handles of the irons, and pivoted to its sides are short legs to be turned down to fit into the slots of gasolene stoves.

PUZZLE.—Chester H. Robinson, Lafayette, Ind. In this puzzle it is required to carry a number of balls through various runs and along various inclines to a platform or table, on which the balls are to be placed in a certain order, all without touching the balls with the hands or fingers. The runs are formed on a flanged board, an inclined plane leading upward from one of the runs and parallel therewith, while the runs are crossed by a second inclined plane connected with the first, there being a track connection between the second inclined plane and a table above the runs.

GAME APPARATUS.—Jerome G. Kiah, Sand Beach, Mich. According to this invention, a flanged board or table is made to represent a baseball field, cages locating the players, an incline the pitcher's box, and a spring-controlled plunger representing the batter. It is designed to facilitate playing a parlor game representing baseball, in which the game will be a contest between pitcher and batter, as in a real game, the pitcher trying to deliver the ball so it cannot be hit, and the batter trying to "get onto" the pitcher's curves.

BOTTLE STOPPER.—Louis J. A. Fernandes, New York City. To prevent the refilling of a bottle which has once been emptied and the offering of a fraudulent package as a genuine one, the neck of the bottle, according to this improvement, is provided with a ball valve normally held to its seat by a spring-controlled spindle, the spindle passing through a partition over the valve, and the valve chamber having side channels communicating with openings in the partition. The spindle is mounted in bearings in an extension of the bottle neck, the extension being cemented to the neck proper after the bottle is filled, and the upper end of the extension being normally closed by a cork. It is easy to pour out the contents of the bottle, after the removal of the cork, but it cannot be refilled without breaking off the extension and a part of its neck.

BOOK SUPPORT.—William A. Barnes, Lampasas, Texas. To hold large journals, ledgers, etc., this invention provides a frame with upright keepers and book-supporting platforms, the latter having at opposite ends upright bars operating in the keepers. Detents engage the upright bars and there are windlass shafts for each platform connected with and adapted to release the detents. The platforms consist of boards having mouldings at their lower edges, and rack bars with ratchet teeth depend from the boards. Either platform may be lifted as desired, where it will be held by pawls, but may be lowered by a slight turning of the windlass.

WINDOW FASTENER.—William Gardiner, Elizabeth, N. J. To hold the window in open or closed position and to lock the sash so that it cannot rattle or move in the window frame is the object of this simple, convenient and inexpensive attachment, which consists mainly of a casing having an opening in its front face, a pin extending across the opening and a sliding friction face having movement on the pin, and the outer portion of the face being parallel with the outer face of the casing. A cam operates on the friction face, and by the movement of the latter a latch is operated. The sash is locked by carrying the cam to an upper position, and the handle of the cam is turned down when the sash is to be raised or lowered.

Designs.

MUSTACHE GUARD CLIP.—William D. Dalgleish, Stamford, Conn. This is approximately a U-shaped clip whose inner member is thickened at the edge and tapers toward the bend of the clip, affording a very simple device for holding a guard on the edge of a cup.

BEER KEG GUARD. — Alexander H. Schram, Oregon City, Oregon. For use in tapping kegs and disconnecting pressure pipes, to prevent spattering, this inventor has devised a guard adapted to be applied over the faucet or pipe connection and with a neck rising therefrom at a point off the center, the device being equally well adapted for use on kegs or barrels where the bung is close to the chine or at a distance therefrom.

TOY.—Oscar McDonald, Jersey City, N. J. At one end of a stick which may be twirled in the hand, according to this invention, is a whistle head and a hoop-like loop across which is pivoted an S-shaped diamond-faced blade, the stick having a light weight at its other end, the twirling of the device forming a child's windwheel and whistle.

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(7099) J. H. B. asks: Will you kindly publish in your next issue recipe for making scouring soap with sand? A. 100 pounds of cocoa nut oil are saponified with about 200 pounds of lye at 20° B. The soap is then hardened by the addition of about 8 pounds of salt dissolved in water to a density of 15° B., with the addition of 6 to 8 pounds soda ash. The mixture is covered up and the foam is allowed to subside. After standing five or six hours the foam is skimmed off and 100 to 150 pounds of dry sifted sand is thoroughly crutched into the mass, and the crutching is continued until the soap is cool. This soap is very firm and hard.

(7100) A. R. G. says: I would like information on the storage battery. Where shall I look for instruction regarding the construction, uses and all things pertaining to them? A. For valuable information, the construction, uses, etc., of storage batteries we refer you to SUPPLEMENT, Nos. 159, 838, 845, and 997, price 10 cents each; we also refer you to "Accumulators," by Salomons, price $1.50; "The Storage Battery," by Warwick, price $1.50; "The Voltaic Accumulator," by Reynier, price $3 post paid. 2. What is the best known conductor of electricity? A. Annealed silver. 3. Does the better conductor entail less loss in transmitting to a distance? A. No; the poorer conductor can be made of larger diameter to compensate. If of equal diameter, then the poorer conductor is less efficient. 4. Does it take quantity or power to produce sparks? A. It takes high voltage, and as the duration of a spark is short, the power for the fraction of a second may be very high, but the total energy very low.

(7101) C. C. S. says: Please state in Notes and Queries for the information of several readers of the SCIENTIFIC AMERICAN the height and base of the several Egyptian pyramids. A. There are some 60 to 70 pyramids in Egypt. The three pyramids near Cairo measure as follows: The great pyramid is 764 feet on the sides and the perpendicular height has been variously estimated at 480, 484, and 485 feet. The second pyramid measures 707 feet on the sides and the height is 454 feet. The smallest pyramid is 354 feet and a few inches on the sides, and the height is 208 feet. You can obtain additional particulars regarding the pyramids by referring to Rawlinson's History of Ancient Egypt, which is accessible at any library.

(7102) H. J. D. says: 1. Kindly inform me through Notes and Queries of the best method to clean parquette floors of grease and dirt. A. Clean the floors with crude petroleum. 2. And, when clean, how to polish the same. A. Take 1 pound of the best beeswax, cut it up into very small pieces, and let it thoroughly dissolve in 3 pints of turpentine, stirring occasionally if necessary. The mixture should be only a trifle thicker than the clear turpentine. Apply it with a rag to the surface of the floor, which should be smooth and perfectly clean. This is the difficult part of the work, for if you put on either too much or too little, a good polish will be impossible. The right amount varies, less being required for hard, close grained wood, and more if the wood is soft and open grained. Even professional waxers are sometimes obliged to experiment, and novices should always try a square foot or two first. Put on what you think will be enough, and leave the place untouched and unstepped on for twenty-four hours, or longer if needful. When it is thoroughly dry, rub it with a hard brush until it shines. If it polishes well, repeat the process over the entire floor. If it does not, remove the wax with fine sandpaper and try again, using more or less than before, as may be necessary, and continue your experimenting until you secure the desired result. If the mixture is slow in drying, add a little of the common driers sold by paint dealers, japan, for instance, in proportion of 1 part of the drier to 6 parts of turpentine. When the floor is a large one, you may vary the tedious work of polishing by strapping a brush to each foot and skating over it. 3. Can you tell a remedy for removing stains from marble or earthenware washbowls, etc.? A. Take 2 parts sal soda, 1 part pumice stone, and 1 part finely powdered chalk; sift it through a fine sieve and mix with water; then rub it well all over the marble, and the stains will be removed; then wash the marble over with soap and water.

TO INVENTORS.

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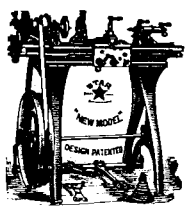

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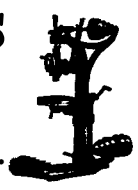

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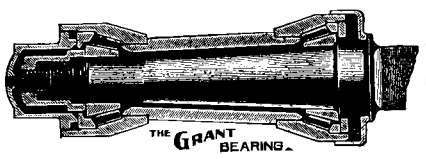

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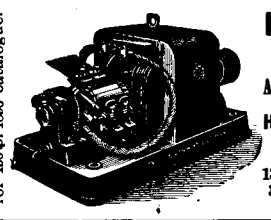

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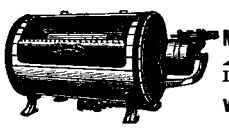

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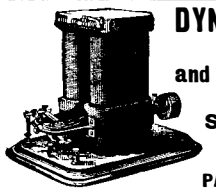

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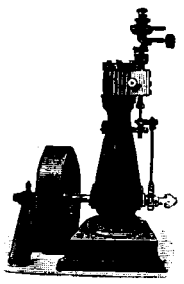

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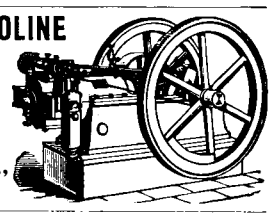

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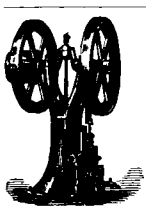

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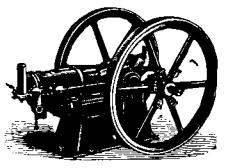

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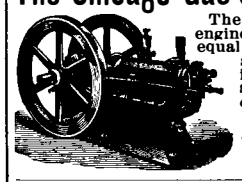

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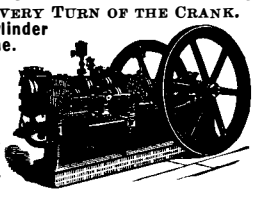

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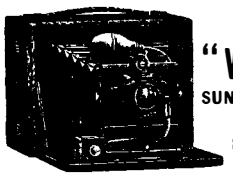

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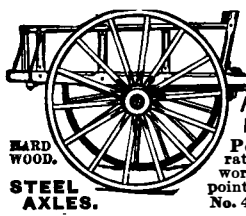

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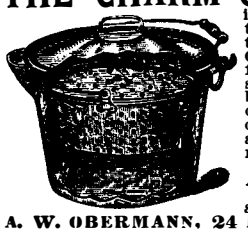

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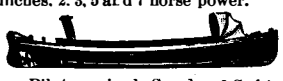

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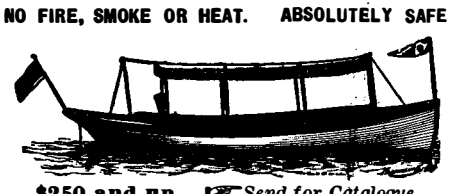

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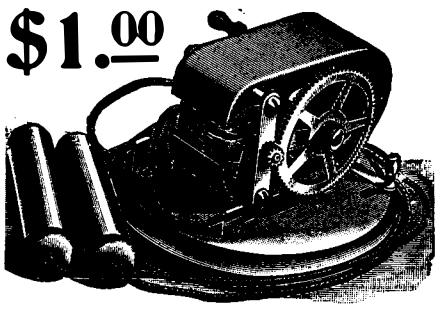

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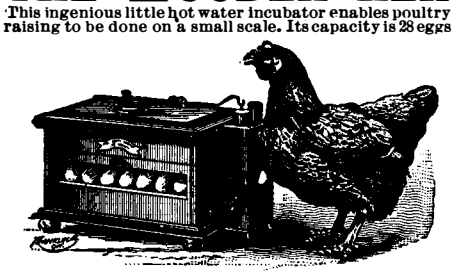

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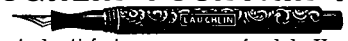

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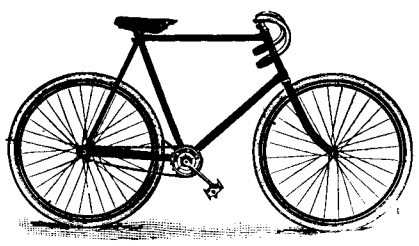
Tribune Bicycle

Tested and True.



The Easiest Running Wheel in the World.

☞ *Send for Catalogue.*

THE BLACK MFG. CO., ERIE, PA.

Nickel Silver Watches

We are casing all sizes of movements in this new metal. It takes a better finish and is more enduring than sterling.

It supersedes the old nickel plate, and enables one to have a perfect timepiece at small cost.

Our Solid Gold and Filled Cases, as well as Sterling Silver and Enameled patterns, are in greater variety this season than ever.

New specialties have been added.

Our '97 Model

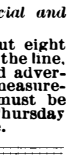
Trump Cyclometer,

the 10,000 mile wheel recorder, are all shown in our new catalogues, which will be sent to all.

The Waterbury Watch Co.
WATERBURY, CONN.

GARDNER GRINDER FOR FLAT SURFACES ACCURATE & RAPID FOR UP-TO-DATE SHOPS
CHESLY & Co. CHICAGO ILL. U.S.A.

AMERICAN SCREW CO'S
New Cold-Forged Wood Screw



☞ *Send for Sample.*

Patented May 10, July 19, '87; Oct. 29, '89; Aug. 19, Oct. 21, '90; April 7, May 12, '91; July 19, '92.

FACTORIES: PROVIDENCE, R. I. LEEDS, ENGLAND. HAMILTON, ONT.

AGENCIES:
New York, 94 Chambers St. Chicago, 19 Lake St.
Baltimore, 14 W. German St. San Francisco, 23 Davis St.
Philadelphia, 518 Commerce St. Boston, 36 Pearl St.

The American Bell Telephone Company,

125 Milk Street,
Boston, Mass.

This Company owns Letters-Patent No. 463,569, granted to Emile Berliner November 17, 1891, for a combined Telegraph and Telephone, covering all forms of Microphone Transmitters or contact Telephones.

To Bicycle Riders

WE MAKE OUR TUBE of FIFTY CARBON STEEL

Because a Tube like this of our .50% CARBON STEEL Is just as strong as a Tube like this of .25% CARBON STEEL

While WEIGHT FOR WEIGHT in a Bicycle our FIFTY CARBON Steel will last so long and TWENTY-FIVE CARBON Steel will last only so long . . . . .

NOTE THE FULL IMPORT OF THE PARALLEL LINES.

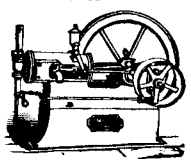
The comparison which they graphically make indicates the result of the prolonged investigations of the most practical experts of the world.

That the tests in our own laboratory corroborate these results is merely so much to its credit; that the same is true of actual trial on the road equally proves the trial to have been made in bicycles of correct design and construction. THE FACT REMAINS.

The margin of safety is greatly increased by the use of this tube. Every bicycle manufacturer should use it; every dealer should insist on having it; every rider should demand it.

Send for Catalogue. **THE POPE TUBE CO., HARTFORD, CONN.**

THE CHARTER GASOLINE ENGINE

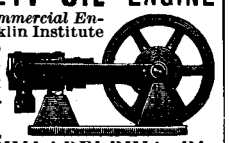


is used for almost every purpose power is applied to under the sun, and is unequaled.

Full particulars by addressing
CHARTER GAS ENGINE CO.
Box 148, Sterling, Ill.

PRIESTMAN SAFETY OIL ENGINE

"A thoroughly successful commercial Engine using a Safe Oil."—Franklin Institute



No Extra Insurance, No Steam, No Gas. No Gasoline. Reliable, Safe, Economical, and Convenient. Chosen by Nine Governments. Used for nearly every purpose.
PRIESTMAN & CO., Incorp'd,
530 Bourse Bldg., PHILADELPHIA, PA.

At ¼ Price Bicycles, Watches Guns, Buggies Harness, Sewing Machines Organs Pianos Safes, Tools Scales of all varieties and 1000 other articles Lists free CHICAGO SCALE CO., Chicago Ill.

JESSOP'S STEEL THE VERY BEST FOR TOOLS, SAWS ETC.
WM JESSOP & SONS LD 91 JOHN ST. NEW YORK

The Real Value

of a watch depends upon the accuracy of the movement and not upon the price of the case. The *"RIVERSIDE"* and *"ROYAL"* Waltham Watch movements are most accurate time-keepers.

For sale by all retail jewelers.

IT WILL THROW MORE WATER WITH LESS STEAM THAN ANY OTHER JET PUMP.

THE PENBERTHY XL-96

Improved Ejector, Siphon or Jet Pump

will lift 20 feet with 25 lbs. steam, and 25 feet with pressure at 40 lbs. or over. Will elevate 50 feet at 60 lbs. pressure and 65 to 75 feet on 80 to 100 lbs.

☞ *Descriptive Circular on Application.*

PENBERTHY INJECTOR CO., 116 7th St., Detroit, Mich.
Largest Injector Manufacturers in the World.

Est'd 1863. **Glass**; Brooke, Moulds, Expert Making New Articles. Removed 44 Barclay St., N.Y.

A Great Mining Triumph

Capt. J. R. DeLamar, of New York City, is one of the largest owners and workers of Gold Mines in the world. After the most careful investigation he purchased in August, 1895, two Griffin Mills, and his report is so remarkable as to demand the careful attention of every one interested in Gold Mining. We give it in his own words.

NEW YORK, Jan. 9, 1896.

BRADLEY PULVERIZER CO. *Gentlemen:*—The two Griffin Mills have been in operation now for 90 days on the hardest rock, with the exception of corundum, that I have ever met during my mining life. They have taken the rock direct from the breaker, and they average about 20 tons to each machine, 40 mesh fine, without elevating or bolting. We simply put a ¼ mesh screen around the Griffin Mill, and the stuff comes out 40 mesh fine or over, which makes it an excellent pulp for leaching by cyanide or chlorination; therefore we have concluded to order **10 more Griffin Mills.** We have tried high-speed rolls and dry stamps, and after looking into the Huntington Dry Pulverizer, the Narod Pulverizer, the Stedman Pulverizer, the Frisbie Lucop, the Cook, and various other dry pulverizers, unhesitatingly recommend your Griffin Mill to any one.

Yours truly, (Signed) J. R. DELAMAR.

HOW 10 GRIFFIN MILLS WORK.

DELAMAR'S NEVADA GOLD MINING CO.,
SALT LAKE CITY, UTAH, Nov. 24, 1896.

BRADLEY PULVERIZER CO. *Gentlemen:*—In answer to your inquiry as to what the "Griffin Mill" is doing at our DeLamar Mill, DeLamar, Nevada, we beg to state that we often run 310 tons per day with 10 of your mills in operation, and on one occasion these 10 mills produced 408 tons in one day. I have no hesitancy in stating that they will regularly produce at least 30 tons per day each on our ore, which is extremely and unusually hard.

Yours very truly, H. A. COHEN, *General Manager.*

These strong letters coming from such representative men are conclusive evidence that we are right in claiming that the "Griffin Mill" will produce a larger amount of finer pulp at less cost than any other stamp or pulverizer made.

Let us send you a free copy of our illustrated pamphlet, which will tell you all about the Mill and bring to you other evidence of its great achievements.

BRADLEY PULVERIZER CO., 92 STATE ST., BOSTON, MASS.

THOROUGH INSPECTIONS

AND INSURANCE AGAINST LOSS OR DAMAGE TO PROPERTY AND LOSS OF LIFE AND INJURY TO PERSONS CAUSED BY

STEAM BOILER EXPLOSIONS

J. M. ALLEN, PRESIDENT W. B. FRANKLIN, VICE PRESIDENT
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Free! Free!

THE ELASTIC TIP CO.'S New Invention Calendar will be mailed either from Boston, Chicago, or San Francisco, FREE, only send necessary mailing expense, five 2c. stamps.

PHOTOGRAPHIC SIMPLICITY.

Is embodied in the Pocket Kodak.

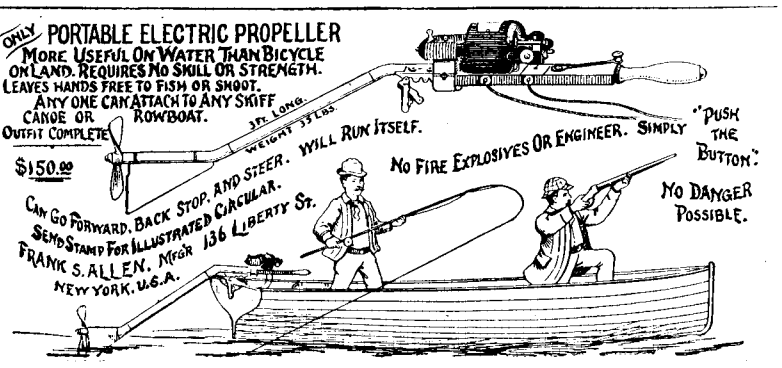
EASTMAN KODAK CO.
Booklet free at agencies or by mail. Rochester, N. Y.

TUBULAR DRIVING LAMP.

IT is the only perfect one.
IT will not blow or jar out.
IT gives a clear, white light.
IT is like an engine headlight.
IT throws the light straight ahead from 200 to 300 ft.
IT burns kerosene,
Send for book (free).

R. E. DIETZ CO., 60 Laight Street, New York.
Mention this paper and get special discount.

ESTABLISHED 1840.


ONLY PORTABLE ELECTRIC PROPELLER
MORE USEFUL ON WATER THAN BICYCLE ON LAND. REQUIRES NO SKILL OR STRENGTH.
LEAVES HANDS FREE TO FISH OR SHOOT.
ANY ONE CAN ATTACH TO ANY SKIFF CANOE OR ROWBOAT.
OUTFIT COMPLETE $150.00
3 FT. LONG. WEIGHT 35 LBS
WILL RUN ITSELF.
NO FIRE EXPLOSIVES OR ENGINEER. SIMPLY "PUSH THE BUTTON."
NO DANGER POSSIBLE.
CAN GO FORWARD, BACK STOP, AND STEER.
SEND STAMP FOR ILLUSTRATED CIRCULAR.
FRANK S. ALLEN, MFGR 136 LIBERTY ST. NEW YORK, U.S.A.

NOW READY!

Complete Volumes of the

Building Edition of the Scientific American

For the Year 1896.

The last Semi-annual Bound Volume, including the numbers from July to December, 1896, is now ready for delivery, and will be mailed, postpaid, for $2.00. It forms the twenty-second semi-annual volume; all the preceding semi-annual volumes, except volumes 4, 7, 8 and 18, will be supplied at the same price, $2.00 a volume. The bound volume for the full year 1896 is also now ready, and will be mailed, prepaid, for $3.50; at which figure we can likewise furnish the yearly bound volumes for 1890, 1891, 1892, 1893 and 1895.

Each yearly volume contains upward of two hundred examples of the latest and best designs for residences, ranging in cost from $2,000 to $20,000. Floor plans and perspectives are given, together with numerous colored plates and many interior views. The illustrations include seashore, Southern, colonial and city residences, churches, schools, public buildings, stables, carriage houses, etc.

All who contemplate building or improving homes or structures of any kind, have in this handsome work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

☞ *Send 25 cents for single copy of the Building Edition.*

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